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ABSTRACT

The aim of the research program of the research center for environmental and health education is to promote an awareness of the interrelationship between society and its environment. This volume contains four papers which were given at various international meetings in 1988. Reported are: (1) Danish environmental education and school initiatives including inservice teacher education programs, 23 pilot programs, and two case studies (C. U. Christensen); (2) the Danish environmental education project (C. U. Christensen); (3) the ideology and developmental foundations of environmental education (S. Breiting); and (4) public perceptions of the nature of environmental programs and their solutions (L. Lorring, K. Nielsen, and K. Olwig). (CW)

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Environmental Education International contributions 1988

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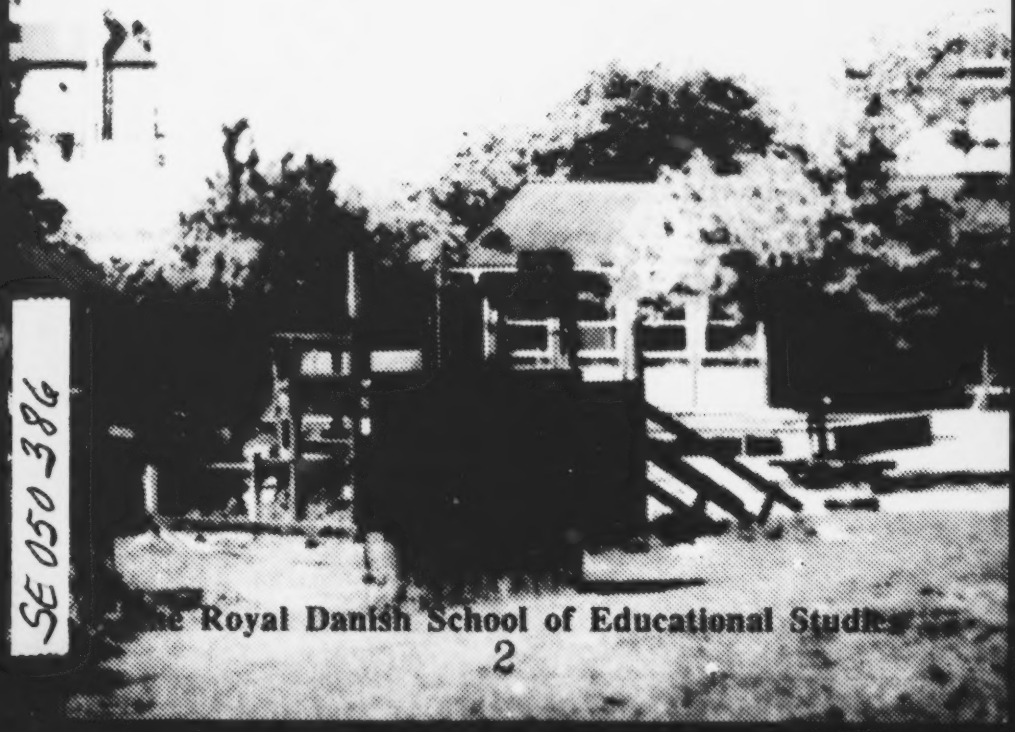

SE 050 386

The Royal Danish School of Educational Studies

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Environmental Education

International contributions 1988

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Environmental education
International contributions 1988

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Research program for environmental and health education

Aim

The aim of the research program is to contribute to a development within the *Folkeskole* which promotes an awareness of the inter-relationship between society and its environment These problems are treated as an overarching challenge to the school and not as subject matter, which only can be considered from the perspective of a particular school subject.

Consequently, the main intentions of the program are:

- to take a general pedagogical starting point,
- to contribute to an exceeding of the traditional subject limits,
- to integrate disciplinary concepts and skills into "problem oriented" education.

Content

The program will seek to treat environmental and health education as a whole. Human health is increasingly effected by environmental conditions and environmental problems are bound up with a concept of health. In this form of teaching pupil initiatives are essential and therefore it is important for them to understand how the problems are generated. This means, however, that education can assume a problem oriented, often controversial, character, when concentrating on local and global social interests and conflicts.

Some of the research activities of the program are connected with the following approach to problems:

- The effect of problem oriented education on the role of teacher and student.
- The relation between problem oriented education and the traditional content of individual subjects.
- The perception of conflict and harmony transmitted by education.
- The importance of pupils conceptions of environment and health for education.
- The connection between nature experience and the development of environmental consciousness.
- Educational aspects of knowledge, attitude and action.
- The role of values in environmental and health education.
- Central conceptions in environmental education.
- The historical background for the development of environmental and healths problems.
- The connection between environmental education and political awareness.

Our first general project has been the development of a nationwide in-service training course in environmental education in 1988/89.

The following articles present some of the experiences with environmental education which this work has generated.

Draft

CERI/EI/88.03

Organization for Economic Co-operation and Development

Restricted

Center for Educational research and Innovation

Paris, drafted: 11th July 1988

Environment and School Initiatives

International Conference on Strategies of Teaching and Learning Environmental Issues in Primary and Secondary Schools

(Linz, Austria, 26th-30th September, 1988)

Danish Report

1. The attached report, prepared by Christian U. Christensen, is the Danish contribution to the CERI programme on Environment and School Initiatives. It outlines the national context for environmental education in Denmark and describes the school activities that were undertaken for this project.
2. It is made available as background information for the conference.

Environmental Education in Denmark

By Christian. U. Christensen, The Royal Danish School of Educational Studies[1].

The Danish educational system

The primary and lower secondary education in Denmark takes place in the *Folkeskole*. It is compulsory for children between 7 and 16 years of age. A one year optional pre-school class is provided for children of 5 or 6 years of age.

After the *Folkeskole* the pupils proceed to technical and vocational training or to the upper secondary school, the gymnasium (three years). The gymnasium gives access to higher education at universities, teacher training colleges etc.

The teachers of the *Folkeskole* are educated in teacher training colleges and receive further education at DLH.

The account below covers only *Folkeskolen*, teacher training colleges and DLH.

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[1] The Royal Danish School of Educational Studies (Danmarks Lærerhøjskole, in the following: DLH) is a State institution for in-service training and post-graduate education of teachers in the *Folkeskole* and teachers in teacher training colleges. In addition to the teaching activities, the institution has research obligations corresponding to those at the Department of Education at universities in most other countries. DLH serves the entire nation and consists of the main branch in Copenhagen and 7 provincial branch institutions.

The management of the individual school

Each school is run by the local authority[2]. The individual school is managed by the headmaster, who is responsible for the administration of the school and who has the general responsibility for the observance of the local curriculum. In the day-to-day teaching each teacher decides the content and the organization of the teaching, which he finds will be the best possible observance of the curriculum.

Education and the further training of teachers.

During the studies at the teacher training college, the students are trained to cover all class levels in three subjects: Danish and two optional subjects.

There is no official training in environmental education, but environmental problems are implicated in the teaching of biology (in some places also in geography and contemporary studies).

Further education of teachers takes place at DLH and the enclosed project is based upon the further education of teachers.

The teachers' participation in the courses at DLH is part of their work and the local authorities pay for their substitute. The teachers themselves choose whether they want to take part in further education, but the local school authorities have a decisive influence. The teachers attendance in further education averages three lessons a week for a year once every fifth year.

Education Act and curriculum

The Education Act, operative from 1975, covers the whole country. The general objectives stated in the Act stipulate which subjects to teach, as well as the number of lessons for each subject.

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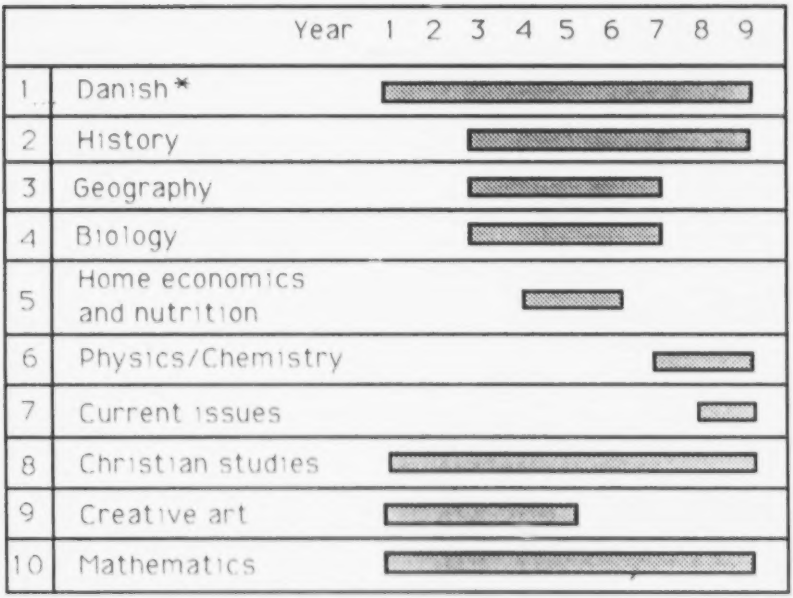
[2] Denmark is divided into 272 local authorities (kommuner).



Survey of compulsory school subjects involved in the Environment and School Initiatives in Denmark.

* Includes health education

The subjects and the objectives are binding for the whole country. The objectives contain the following phrase: "The *folkeskole* prepares pupils for taking an active interest in their environment, for participation in decision-making in a democratic society, and for a share in the responsibility for solving common problems. Consequently teaching and the entire daily life must be based on intellectual liberty and democracy."

Environmental education is not mentioned in the Danish Education Act.

The Ministry of Education has worked out instructive curricula for each subject. The stipulation of the contents in the curricula are phrased very broadly and gives the local authorities an extensive freedom in the planning of the teaching of statutory subjects. Environmental education is not dealt with in these curricula, but it is mentioned

that environmental problems may be made subject for teaching in biology, geography and current issues.

The curricula that are binding for the individual schools are drawn up by the local authorities. Most local curricula are close to the curricula of the Ministry of Education; the content of the teaching is broadly phrased too. To our knowledge no local curriculum for environmental education exists, and nowhere is environmental education taught as a subject.

The teachers are free to choose teaching methods themselves and this, together with the broadly phrased curricula, results in a wide margin for the individual teacher to plan and to carry out the teaching. The subjects in which, according to the curricula, the environmental problems may be dealt with (biology, geography and current issues) require no examinations, and the individual teacher is responsible for the observance of the curriculum. This implies that the margin within which the individual teacher decides the extent of the environmental education is fairly wide.

A class is often taught several subjects by the same teacher, e.g. Danish, biology, geography and history. If the teacher wants to work with environmental problems, the topic is often dealt with in more than one subject, which does not create significant difficulties. It is usual for a class to have the same teacher over several years, sometimes during all the school years; this, too, gives an extensive freedom in the planning of the schoolwork.

Excursions, factory visits etc. requiring only small changes in the timetable is easily arranged with the other teachers and the headmaster. The excursions provide the possibility to teach outside the school. Unfortunately, recent cuts in the school-budgets has made it more difficult to arrange longer excursions.

Innovations

The Danish *Folkeskole* has a tradition for an extensive experimental teaching, which is planned and carried out in the schools by the teachers, and changes in the Education Act have several times been in the nature of a legalization of already established praxis.

Within the frames of the Education Act it is possible to experiment with change of content and method in the individual subjects, fusion of subjects, and the introduction of entirely new subjects. Prior to the experiment an application has to be forwarded , via the local authorities,

to a central council (*Folkeskolens Forsøgsråd*), which is most positive to experiments of any kind. Many experiments take place in this context, but the number of experiments in environmental education is still very limited.

At some schools the teachers deal with environmental problems within the existing subjects and in various forms of interdisciplinary teaching involving several teachers without applying to the *Folkeskolens Forsøgsråd*. This is possible if the experimental teaching does not differ too much from the objectives of the curriculum. The extensive pilot project, which is described below, was arranged by the teachers themselves and the headmaster of the school, without involving the central council.

Thus, the possibilities of carrying out experiments in environmental education are very favorable. On the other hand it is beyond doubt that a legislation in this field is requested, if we want to ensure that all pupils work with environmental problems in school.

Some environmental education takes place in the biology lessons and within the described experiments, but environmental education does not have a very prominent place in the Danish *Folkeskole*. There has been a considerable development during the last few years, though, and the present project is the most extensive in the field.

Preparation of nation-wide INSET programme for school teachers

Introduction

In 1984 the Danish Ministry of Education and the Ministry of the Environment co-operated to arrange a conference, the purpose of which reflects the need for environmental education, but also the uncertainty as to the content of the teaching and how, and to what extent, it ought to be included in the *Folkeskole*.

The main objects of the conference were, among other things:

- to draw attention to the fact that a thorough knowledge among people is essential, provided the future environmental problems are to be solved on a democratic basis,
- to draw attention to the fact that the social significance of the appreciation and awareness of nature, of considerations of the environment and of resource management will increase,
- to contribute to a debate on the extent of environmental education in the relevant subjects in the *Folkeskole*.

A rapid dissemination of environmental education implies an extensive further education of school teachers. Thus The Royal Danish School of Educational Studies has decided to prepare an in-service teachers' training programme, which will cover the whole country and is planned to run during the autumn 1988 and the spring 1989.

In the light of the somewhat unclarified status of environmental education we have designed the in-service programme to be run as a number of educational development studies.

The Central Concerns of Environmental Education

Crucial to environmental education are various social interests connected to the man-nature relation.

Environmental education is interdisciplinary, problem-oriented and implies action.

In uncovering the interrelationship between the various perspectives of environmental problems, through a combination of the humanities, the social and the natural sciences, these problems are perceived as part of a wider social context.

The environmental education aims at helping the pupils to see the environmental problems from many angels as well as to reach a more active, analytic, and democratic consideration of environmental problems.

The Purpose of the In-service Programme

The purpose of the in-service programme is to develop educational experiences in implementing teaching, based upon local environmental

problems, at different class levels as well as to draw up materials for environmental education for the local educational authorities.

The in-service training will take place in study groups composed of teachers from each educational district. The teachers will work together on the educational development study. The groups will be supplied with educational material and supported by an adviser from DLH.

The programme aims at bringing the pupils out of the classroom and to make them and their teachers use the local environment as a source in their work in the same way as the use of more traditional teaching materials.

The participating teachers are supposed to carry out experimental teaching with their own classes during the course, and the experiences from this is to be drawn into the work of the study group.

Study Materials

The study materials consist of a book of "Perspectives" and a book of "Examples".

The book of "Perspectives" attempts to throw light on essential general and theoretical features of environmental issues and of environmental education. The idea with the book of "Perspectives" is to provide the participating teachers with a serious background and to support them with perspectives during the implementation of the teaching.

The book of "Examples" is drawn up on basis of a number of experiments with environmental education which has been carried out all over the country. The experimental teaching has taken place at all class levels and a variety of environmental issues have been dealt with. Thus, the book consists of tangible descriptions of the experiences from the finished projects. The descriptions include the purpose and content of the teaching, advantages and disadvantages of the applied methods and materials, and a listing of institutions, authorities, trades, and industries who have been willing to contribute to the implementation of the projects.

The experimental teaching projects

During the spring of 1987, pilot projects were carried out at 22 schools, involving 35 school classes. A brief summary of the 22 pilot

projects as well as a more elaborate description of two projects, which were carried out in Copenhagen, and in a provincial town (Herning), are given below.

The teaching projects were implemented to produce realistic examples which were actually based on the experiences in school and which would point out how to deal with environmental problems within the present framework of the *Folkeskole*.

Prior to the implementation the following general terms of reference were drawn up:

A considerable part of the teaching in all the pilot projects will deal with a local environmental problem. The teaching will be problem oriented and interdisciplinary. The teaching will include activities in the environment of the school and, as far as possible, inspire to action.

Each project group has consisted of a number of teachers with different professional background and an advisor from DLH. Based upon the general terms of reference, the groups have chosen topic and class level. Each group has phrased the objectives of the project and planned the teaching, and the pilot projects, therefore, represent different conceptions of environmental education.

Survey of the pilot-projects

1. Skolen på Islands Brygge, Copenhagen

Death among the eel. - Pre-school class, grade 1 and 2. Subjects (1,8,9,10)[3].

The projects runs parallel in six classes and is based on the children's conception of the local environment. A massive death among the eel in the moat changes the content of the project. The pupils try to find the answer to the death of the eel by studying and by approaching organizations and the local authorities.

3 Subject numbers correspond to those of the survey of compulsory school subjects page 6

2. Herlev skole, Copenhagen

The immediate environment. - Grade 2. Subjects (1,9).

The pupils investigate the playing-grounds in various housing areas. They work out alternatives and discuss financial matters with members of tenants' associations. Finally they visit the allotment gardens in the neighborhood.

3. Bakkeskolen and Købmagergades skole, Fredericia.

Rubbish. - Grade 2 and 4. Subjects (1,9,10).

The pupils collect rubbish from two public beaches; this leads to a closer analysis of domestic rubbish, and to a visit to a rubbish container yard and a recycling station.

4. Mølkærsskolen I, Munkebo

Urban and housing environment. - Grade 3. Subjects (1,2,3,4,9).

The education deals with the pupils' immediate environment (their own room, the class-room, the environment of the school, housing areas). They visit a building site and talk to town planners and others, and they plant a small forest next to the school.

5. Vor Frue skole, Næstved

Project Limetree. - Grade 3. Subjects (1,2,3,4,8,9).

The Project Limetree emphasizes the aspect of experience and the project is based on an old sick limetree in the school courtyard. The pupils visit a forest, a nursery and a sawmill and they count the trees in the city center of Næstved. A dramatizing of the history of the tree terminates the project.

6. Hagested skole

Environment - rubbish - recycling. - Grade 3 and 4. Subjects (1,2,3,4)

The pupils visit a dump and a recycling station. At the school they work in various workshops (recycling and compost heaps). At the closing of the project the pupils set up an exhibition.

7. Mølkærskolen II, Munkebo.

The sea - larder or sewer? - Grade 4. Subjects (1,2,3,4,8,9)

The pupils deal with two main topics: The aquatic plants and wildlife and the carrying capacity of the sea. The topics are illustrated during walks on the beach and a sea excursion in a fishing boat. Finally a purifying plant and a fish tinning factory are visited.

8. Søndervangskolen, Glostrup

The Environment in Glostrup. - Grade 4. Subjects (1,2,3,4,8,10).

The environment in Glostrup is explored by a study of geographical maps and during excursions noise and dust is observed. The project closes with a happening about colour in food.

9. Sindal Skole

Rubbish. - Grade 4 and 6. Subjects (1,2,3,4).

The rubbish from each family is subject for investigation. A rubbish container yard and a recycling station is visited. The local paper covers the project and grade 6 turns up on the national TV channel.

10. Korsager skole, Copenhagen

Smoke and noise. - Grade 4 and 7. Subjects (1,2,3,4,9).

The starting point is the pupils' own conceptions of their immediate environment and their visions for the future environment. Various environmental observations are carried out (urban land use surveys, traffic noise, dust in the air) in grade 4 as well as in grade 7 and the possibilities to change the existing conditions are discussed. Grade 7 work out a proposal for town planning.

11. Brændgårdskolen; Herning

Gødstrup Lake. - Grade 5. Subjects (1,2,3,4,9).

The heavily polluted Gødstrup Lake is chosen as an example of "How do we want to use nature?" The lake is visited twice, once as an introduction/experience and the second time as a biological object for investigation. The work with the lake implies a social and local historic perspective.

12. Ankermedets skole, Skagen.

One Skagen? Another Skagen? A better Skagen? - Grade 6. Subjects (1,2,3,4,8).

The teachers initiate the project by going through the nature and history of Skagen and general ecological theories are discussed. After this the group deals with environmental problems in Skagen (air pollution, waste water, dumps, purifying plants etc.)

13. Dyrholmskolen, Herlev

The immediate environment. - Grade 6. Subjects (1,2,3,4,5).

The immediate environment (housing and environment) is the subject of a problem- and project oriented course. The pupils phrase the problems themselves and based on these they perform interviews, observations, dramatizing and poetry writing.

14. Holmegaardskolen, Næstved

Lack of oxygen in streams, lakes and the sea. - Grade 6. Subjects (1,2,3,4,10).

The project is initiated by theoretical studies, a three day visit to a Nature school, which implies chemical and biological investigations. After this the pupils visit a purifying plant and they work out a plan for environmental actions at home and in school.

15. Tingbjerg skole, Copenhagen

Environment and housekeeping. - Grade 6. Subjects.(1,2,3,4,5,8).

This interdisciplinary project deals with four topics: Ecological farming/domestic gardens, rubbish/compost (involving experiments with earthworms) and the history of packing consumption.

16. Vestervangskolen, Esbjerg

The North Sea. - Grade 6. Subjects (1,3,4,10).

The subject is dealt with in two phases: A phase covering 4 workshops: traffic/catch - fish/fishery - oil/natural gas - English, where the teacher work out the exercises, and a project phase, where the pupils themselves phrase their exercises.

17. Rødovre skole

"Smog". - Grade 6 and 7. Subjects (3,4,6,10).

The "smog" situation in Copenhagen inspired the project. The air, the weather, and the air pollution are dealt with in three phases: Collection of knowledge, physics/chemistry experiments and the study of a basic book (geography/biology), groupwork based on independent phrasing of the problems and a field visit. An exhibition was set up at the local library and an article was written for the local paper.

18. Bellingeskolen, Bellinge/Odense

Local environmental problems? - Grade 7. Subjects (1,3,10).

Following an examination of the amount of rubbish that is produced during one day within each of the pupils' families, the pupils walk out into the local environment and investigate the possibilities for getting rid of chemical fluids, batteries etc., and they suggest improvements of the school environment. The investigations conclude in the writing of articles for the school paper and the drawing of posters, which are put up in the local shops.

19. Egtved skole

Fresh water conditions. - Grade 7. Subjects (1,2,3,4).

A local stream is the subject for the investigation. The pupils look into the water consumption in the families, waste water and the degree of pollution in the stream. They visit a trout pond farming and are visited by industrial managers and administrators of the environment.

20. Tønder kommuneskole

The Wadden Sea. - Grade 7. Subjects (2,3,4).

The project consists of the preparation of an excursion to the Tidal Flats, the excursion itself and discussions of the contradictory economic and recreational interests involved in the Tidal Flats.

21. Nordre skole, Silkeborg

Rubbish, waste and waste water problems. - Grade 7 to 10. Subjects (1,2,3,4,6,7,8,10).

The project is composed of four different courses with the general title: Rubbish and waste water problems in Silkeborg.
Grade 7 works with a local dump. Grade 8 works with domestic waste water. Grade 9 works with domestic rubbish. Two classes (grade 10) work with industrial waste and visited, among other things, a number of polluting industries in Silkeborg

22. Karensminde skole, Støvring

Recording of water holes. - Grade 8 to 10 . Subject (biology, voluntary).

The pupils help the local committee for *Danmarks Naturfredningsforening* to record the water holes in the area. Through this the pupils are confronted with contradictory interests of the plot owners, the City Council's technical administration and themselves, and they experience the languor of the public systems.

23. Tønder Seminariums øvelsesskole

The nursing of nature. - Grade 9. Subjects (1,7).

The report describes the first phase of a nature nursing project in an area that used to be school gardens and allotment gardens. Today the area is more like a dump. The pupils examine the area and come up with suggestions for the future use of the area.

Brændgårdsskolen, Herning

Participants

A class in a provincial school, ten girls and eight boys, grade five.
One teacher was responsible for the lessons in environmental education. An assistant teacher participated two lessons a week.

Organization

By combining lessons of various subjects, Danish, history, geography, history and creative art, we produced six lessons a week, in which environmental education could take place. The project lasted for six weeks and included 2 excursions, covering 5 lessons each.

Choice of subject

The subject "How do we want to use nature?" was chosen by the teacher. Gødstrup Lake was pointed out as an example. The Lake covers about 50 hectare and is located 4 kilometers north of Herning.

A stream (Herningholm Å) that runs through the lake, has for years received waste water from the central purifying plant, including sixty tons of phosphorus a year. In practice the lake has been utilized as a precipitation basin for the sludge of the waste water.

The lake, therefore, is heavily polluted and characterized by algal bloom followed by deoxygenation and yearly releases of hydrogen sulfide.

In the planning of the course the teacher laid down the main outlines of the project and made out a provisional choice as to teaching materials and line of procedure. He worked out a flexible timetable, fixed the dates for the excursions, and divided the project into three phases: A phase of experience, a phase of investigation, and a phase of action and discussion. At the same time he considered working methods and contents in the different phases.

Because the pupils' point of view was to be taken seriously, not everything was laid down within a fixed framework. The preliminary phase of experience was planned by the teacher alone. But, based upon the pupils' experiences and observations from the first excursions and the resulting opinions and suggestions, an agreement about how and which inquiries to make in order to get the fullest knowledge of the lake, was reached in a discussion between the pupils and the teacher.

Based upon the conclusion, terminating the phase of investigation the teacher and the pupils, once again, reached an agreement as to the content and way of procedure for the phase of action.

The objectives of the teaching

As expressed in The Objectives of the Folkeskole one of the purposes of education, and consequently of the environmental education, is to train the pupils for participation in decision-making in a democratic society. Thus, it is not sufficient to state and describe environmental problems in environmental education. In order to live up to The Objectives of the *Folkskole*, environmental education must be characterized by the following three conditions:

1. That the teaching must be planned for an understanding of the fact that the relation between nature and society is not given beforehand, but that the destiny of nature is determined by the way society administers nature. Problems found in the environment are direct or indirect consequences of decisions made in society. Furthermore the pupils must understand that questionable conditions can be changed - if we so wish.

Thus, the Gødstrup Lake Project is to generate the understanding that the condition of the lake is a consequence of reflections and decisions, and that we, the adults and children in Herning, are the ones to determine the future destiny of the lake.

2. That the pupils not only obtain knowledge of the actual facts, but also of the possibility of expressing ideas, wishes and utopias - that these are being discussed, and maybe changed on the basis of accessible knowledge, esthetic and ethical conceptions and social reality. The utopian ideas are essential, not as the new conditions we want to create immediately, but as the long term aims we want to reach. The value of the utopian thought lies not only in the possibility of carrying it through completely - it may influence our thoughts and actions here and now as well.

Through direct research the pupils will obtain knowledge of the conditions of the lake and the background of these conditions. Furthermore the pupils will get the possibility to express their ideas and wishes as to the condition and function of the lake.

3. That the pupils acquaint themselves with the possibilities and the limits to influence the democratic decision-making, and that they themselves test some of the feasible democratic actions.

In this connection a discussion of the utopian ideas as opposed to actual conditions and the immediate possibilities is central. A product that will carry the points of view and suggestions beyond the classroom is important too, whether this takes the form of a presentation of the project in another school-class, a direct inquiry to politicians or participation in the public debate on the local radio or in the local paper.

In the course of the project the pupils will choose among the various possibilities, the way in which they want to publish their product. And they will try to influence and convince others through a dialogue and at the same time have their own views modified and elaborated.

The teaching

The phase of experience

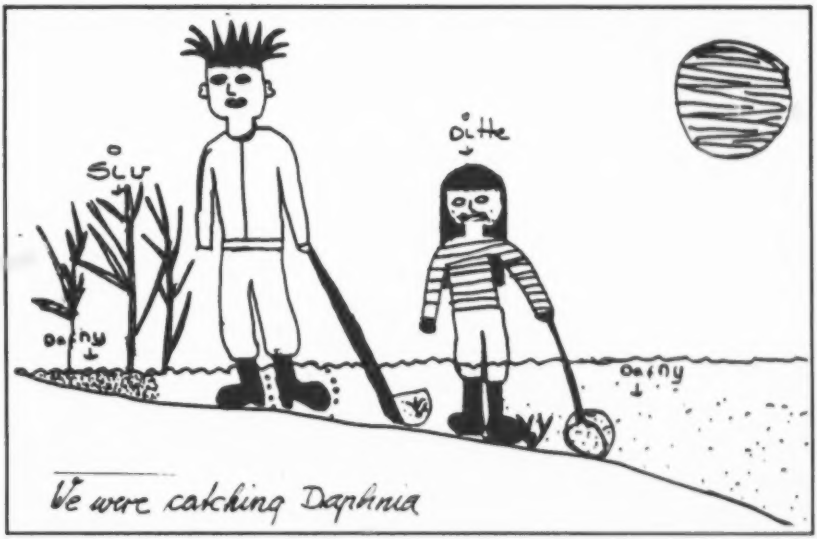
After a brief introduction of the project, a day's excursion initiated the course. The idea was to let the pupils get familiar with the lake, with a view to a more systematic investigation later on. So, we set ourselves up for a real nice outing.

We started the walk at the point where the polluted stream runs into the lake, and walked round to the opposite side to the point, where the stream leaves the lake.

The following observations were made:

- The water running into the lake seems very polluted,
- there are hardly any plants in the lake, but at one spot there were so many filamentous algae that they covered the water as a blanket,
- if you walk around in the lake and stamp the bottom vigorously a lot of bubbles ascend from the bottom,
- there is an enormous amount of daphnia in the water close to the edge,
- there is a lot of plastic and other waste along the edge,
- the water running out of the lake is clear and there are a lot of aquatic plants at the bottom.

There was plenty of time to pick reed mace, catch frogs by hand, eat lunch and talk to a man who was setting his eel traps at the mouth of the stream. The man described how the lake was almost emptied of fish nowadays, whereas formerly a lot of eel were caught in the lake.



Most of the children returned home with their feet soaked, but thought that it had been a great outing.

The phase of investigation

The teacher and the pupils produced a list over the things to explore:

1. How was Gødstrup Lake created?
2. The quality of the water, the life of plants and animals in the inlet and outlet of the stream, and in the lake itself, was to be examined in order to give us an idea of the pollution.
3. What was it like at Gødstrup Lake in the old days?

It was decided that all the results of our examinations were to be depicted on posters, which we would then use in our presentation of the project.

re 1: A local natural historic description of Gødstrup Lake was a valuable source during the course. According to this work the most likely scientific theory is that the origin of the lake is a kettle-hole (left by dead-ice from the last glacial age). Since the lake is located far west of the supposed main stationary line (limit of the last glaciation) there are two probable geological explanations: 1) The kettle-hole is caused

by a local thrust of the ice cap during a temporary cold spell, or 2) the main stationary line has been further west than originally supposed.

The doubt concerning the origin of the lake provided us with the opportunity to illustrate for the class that scientific theories are not necessarily final truths, but probable assumptions, which may be changed in the process of acquiring new knowledge.

On the basis of the theory of the dead-ice the class produced a comic with 6 pictures, showing the development of the area, starting with the ice-sheet and ending with the way the lake looks today.

In addition a map over the lake was produced, showing depth of water and succession of strata of the bottom, as described by *Dansk Geologisk Undersøgelse* in connection with borings made in 1947. An interesting result of the borings shows that the upper strata consisted of at thin layer of silting described as a greenish/greyish mire.

One of the borings showed this layer to be 18.6 m thick. The silting contains much organic material, primarily assumed to be caused by a heavy algal bloom during the 10.000 years, which have passed since the last glacial period. The possible effect of this strata was discussed later in the project.

re 2: The second day of excursion was spent doing biological investigations at the lake.

Before that, the teacher and the pupils discussed and determined, which methods of investigation were to be applied. The class was divided into three groups who carried out identical tests and subsequently compared the results.

Three stations were placed for investigations:

Station 1: The stream at the inlet.

- Gathering of aquatic plants,
- gathering of aquatic animals from the open water, from the vegetation and from the bottom,
- germ testing of the water (Uricult-set).

Station 2: The northern edge of the lake, between the inlet and the outlet.

- Gathering of aquatic plants,
- gathering of aquatic animals,
- gathering of stones from the bottom,
- gathering of plankton.

Station 3: The stream at the outlet.

- Same investigation as at station 1.

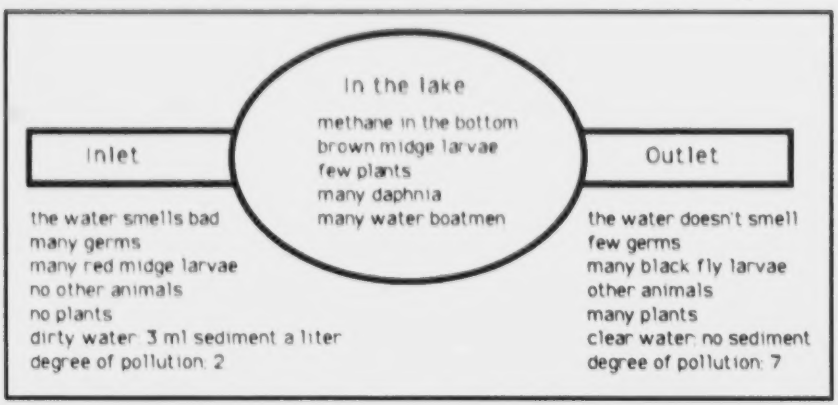
The collected material from each station was brought home in labelled jars. In the classroom all the material was studied and classified, and the biology of a few of the dominating species was studied more thoroughly, algae, daphnia, midge etc.

According to the saprobic classification table, the water at the inlet was estimated to be two, and the water at the outlet to be seven on a scale of ten (ten indicates un-polluted water).

Two bottles of water, each containing one liter, one from the inlet and one from the outlet, were left to precipitate.

The uricult tubes were left three days at room temperature after which they were read and compared.

A sketch of the lake, showing the three groups' most important results, was posted on the wall:



During the termination of this phase we discussed possible causes of our results and the differences between the three stations.

In a double lesson each group wrote down answers to the following questions: Why does the water in the inlet smell bad? Why are there many germs in the water in the inlet? Why are there many midge larvae in the water in the inlet? Etc. All the causes had to be discussed. Positive answers were fine, but guesses, assumptions and "don't know's" were equally acceptable.

In the following lesson the teacher and the class went over the three groups' explanations, point by point.

In this way the following aspects were theoretically examined:

- The significance of the introduction of nutrient salts into streams and lakes (algal bloom resulting in deoxygenation),
- the connection between the introduction of nutrient salts, heavy algal bloom, many daphnia and water boatmen at the edge of the lake,
- the significance of the introduction of mud in the lake,
- the effect of the lake as a purifying plant, depositing mud and nutrient salts.

To illustrate the decomposition of organic material at the bottom of the lake, which, among other things, results in production of methane, we build a model plant, producing methane from plants (grass, potatoes etc). The gas was burnt in a darkroom.

The daphnia, algae and one-celled animals were examined closely through a microscope.

The final conclusion on this part of the investigation:

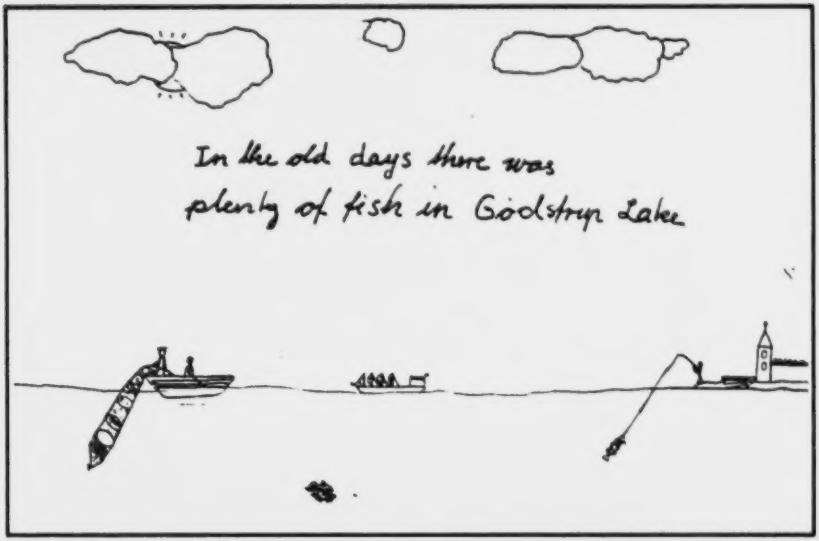
The town of Herning pipes polluted water into Gødstrup Lake, through Herningholm Stream. The lake functions as a purifying plant and is filled up with mud because the water running out of the lake is much cleaner than the water running into the lake.

re 3: A group of pupils and a teacher went through the archives of the local history at the central library of Herning and collected historical information about the lake.

Old photos were copied and the group was shown various relevant texts, i.e. a report from the vicarage of Gødstrup, dated 1766.

The group discovered:

- Where the name of the lake derives form,
- that there has been more water in the streams leading into the lake; the vikings were able to sail into the lake,
- that banks at the lake, descending from the age of the vikings, were extended during the medieval times (middle ages) but were demolished at a later age,
- that there are many legends connecting to the lake,
- that there has been a lot of eel fishing in the lake,
- that Gødstrup Lake used to be a popular place for picnics.



The group produced a poster with texts, drawings and photos and presented the result for the rest of the class.

One interesting result was an old legend about the way in which the plague flew to Gødstrup and covered the lake as a blue apron and made animals and humans ill, when drinking from the water. "The decease of the water has not disappeared completely. Even today the lake turns blue on hot days, and if the cattle drink from the water when it's blue they will die".

During the following discussion in class, we reached the conclusion that, according to the above text, algal bloom and temporary deoxygenation are not only contemporary phenomena. The occurrence of these phenomena, even before the lake was polluted by waste water from the town, might have been caused by a release of nutrient salts from the deposit of organic material in the greyish green silt, which was found in the geological investigations in 1947.

The conclusion on this investigation was: That the lake way back was used for various important purposes, which are no longer possible, considering the present condition of the lake.

The phase of action and discussion.

Three courses were arranged:

1. We would produce suggestions for the future use of Gødstrup Lake and discuss the suggestions.
2. We would present our results for another class.
3. We would write to the local authority and ask them to answer our questions orally or in writing.

The discussion of the future use of the lake produced two suggestions: The lake and the area around it could either be changed into a holiday- and bathing resort or into a nature reserve.

Two groups started to plan how these two suggestions could be carried out and sketched the ideas on big pieces of paper.

A precondition of the implementation of the two suggestions was that the lake was cleaned. Thus, a third group worked out a different suggestion, showing on a peace of paper what would happen to the lake if waste water was continuously conveyed into the lake. The groups presented their suggestions and gave an account of the possibilities of implementing them, of advantages and disadvantages, financial matters etc.

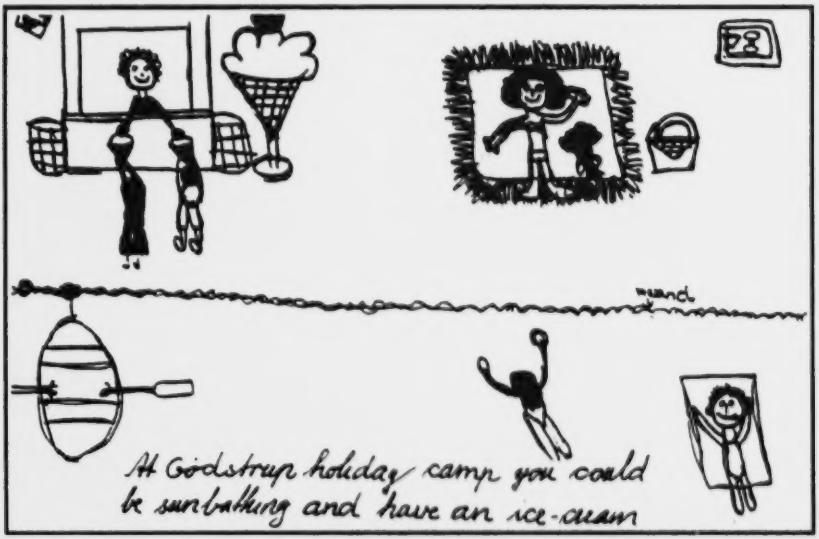
In the following discussion in the class all the proposals were rejected. According to the class, the idea to go on using the lake as a purifier and a precipitation basin was out of the question. Even though they realized that it would be expensive, the waste water was to be cleaned before it left the purifying plant and the precipitation was to be removed from the lake.

The proposal of building a holiday- and bathing resort seemed more attractive to many pupils. It would probably be expensive to build, but it created opportunities for making a profit later on.

Yet the proposal was rejected. Even if the lake was cleaned the old reports showed that the possibility of heavy algal bloom and release of hydrogen sulfide still existed. And if that happened the whole project would be bankrupt.

Many people, much traffic and noise in the area would create problems as well. All the wildlife would be frightened away.

The proposal of making the area a nature reserve seemed a pleasant thought to many of the pupils, but it was discussed whether the area was suitable for that purpose. Wide areas of agricultural land would have to be bought and turned over to the reserve. It would be very expensive and there were no possibilities of any profit to be made.



Moreover, it was questioned whether there was anything particular or exciting in the area to justify that it was turned into a nature reserve. This proposal was rejected as well.

It turned out that even though none of the proposals were entirely satisfactory, according to the class, most of the pupils had taken a clear standpoint as to the future of the lake:

The pollution of the lake had to be stopped and the mire at the bottom had to be removed. When the lake regained it's natural condition it could be used for swimming and sailing. Fishing would have to be permitted and trout could be released in the lake. The local authority might build a nature school in the area, and the cottages could once again be a place for holiday excursions.

During the period in which the three groups worked with the proposals for the future of the lake, a fourth group had written a letter to the local authority. The letter was sent to the members of the City Council, who were also members of the Committee of Technique and Environment.

To the local authority of Herning

We are a grade 5 class at Brændgårdskolen who has worked with Gødstrup Lake.

We would like to talk to you about the conditions of the lake.

We have been out there twice and carried out various investigations.

We took some germ samples and found that there were a lot more germs in the inlet than in the outlet of the lake. In the inlet we found only midge larvae and no other aquatic animals because they can't live in the polluted water and there were no aquatic plants either because there is no light at the bottom.

The water smells very badly and rotten. We brought some water from the inlet and the outlet back home and poured it into some jars to measure the amount of sediment.

In the inlet there were about 3 cubic centimeter of sediment pr. liter. In the outlet there was no sediment but the water was quite clear.

We have found out that Gødstrup Lake is like a purifying plant when Herning town lets out the waste water and that the lake is being filled up with mud.

Is the lake still to be used to clean the waste water or will that be changed?

We would be very pleased if you would answer this question and tell us what you have in mind maybe you could do so in a letter, but we would prefer it if one of you could come to the school and tell us about the plans for Gødstrup Lake.

We have a few suggestions ourselves which we would like to tell you about.

Yours sincerely

5B, Brændgårdskolen

The presentation of the project to the other class was postponed until we had received the answer from the local authority.

Some of the pupils had, on their own accord, started to sketch the lake as it might have appeared in the age of the vikings and during the

plague in the seventeenth century. A consequence of this was that the whole class agreed to make a creative art excursion to the lake as soon as the weather was fine.

Evaluation

At the start of the project, most pupils knew that Gødstrup Lake was polluted, but only a few had ever been there in spite of the lake being located near Herning. At the end of the project the class had, through the investigations confirmed that the lake was polluted - and yet found it a nice place to go to. This was obvious from the consent and approval of the choice of Gødstrup Lake as the creative art excursion destination. This excursion was an unplanned derivation of the project. To express the personal feelings one may have to a lake, and to describe it by way of creative art must be as important as writing a report based on biological examinations.

The class has manifestly stated that they have enjoyed the programme in environmental studies. The excursions, the studying of wildlife, the history of the vikings, and the writing of letters to the authorities were emphasized as good events. Up till now we still don't know whether we have generated a dialogue with the local politicians. Of course both teachers and pupils are very keen to discuss Gødstrup Lake with the administrators and those who make decisions. Yet, if we don't get any reaction on our letter, the mere process of writing a letter without receiving an answer is an important experience in itself - an experience which ought not to lead to the view that "they are the ones to make decisions, and it makes no difference what I do", but an experience which we can use productively in future school work.

Teacher and author of the report of Brændgårdskolen: Per Buskov
DLH-adviser: Alex Schou

Skolen på Islands Brygge

This school is located in a densely populated and industrial area. The Soy bean cake/chlorine plant is probably the best known industry outside the area because of the pollution it sheds out over the neighbourhood and the explosion danger it represents. Locally the plant has been

given the nickname: "the Soy cake". The Islands Brygge area is surrounded by the common: a wide nature resort bordering the University of Copenhagen, the Harbor and the moat, and appears as an island in the heart of Copenhagen.

The school makes a point of a system with few teachers for each class - a system which has the advantage of a coherent daily school praxis, and a close connection between subjects. The disadvantage of the system may be that the few teachers, between them, do not cover a sufficiently wide range of subjects. In this project we tried to make up for that by establishing a close cooperation between the adviser and the teachers. We met frequently and discussed the progress of the individual classes, and this secured a teaching in accordance with our ideals.

We have a tradition for not splitting the work up into subjects and go by a fixed structure. On the contrary, through project- and topic-oriented work, we try to hold those factors together that are coloured by the experiences and conceptions of the children and, at the same time, to integrate the subjects which will throw light over a given topic in the best possible way.

The teachers participating in the environmental project covered the following subjects: social science, biology, geography, music, creative art, current issues, Danish, and history.

One pre-school class, 2 grade-1 classes, and 2 grade-2 classes participated in the project.

Organization

The organization of the project was initiated by a discussion between the teachers about the organizing of the work: were we to split up the classes and base the reorganization on the pupils' individual ideas? We decided against this because the pupils had just been through a week like that. Instead we chose to have the classes work parallel. So the ideas of the individual class structured the course of the project, and the teachers would keep in close contact and draw from the experiences, skills, and ideas of each other.

Our point of departure was the children's conception of environmental problems, which had typically grown out of their daily experiences and observations. It followed from this that the organization and planning of the project would center around the specific problems of the area: the "soy cake", the Harbor, the common, the moat, as well as

the dog shits on the streets and the pollution from the cars. With the conspicuous and concrete character of these environmental factors, and with the excursions and follow-up of theories and observations the project became very time-consuming and it wasn't unusual for us to spend a whole day on the project and on other days a lesson or two.

Way of procedure

Phase one

In all the classes the pupils were asked to give their opinion on a local environmental problem by finishing the phrase: "It's too bad that.....". It was very easy for the children to express their ideas of local environmental problems and they included public problems: the filthy water in the Harbor, the pollution from the "soy cake", as well as private problems: noise from the local pub, the lack of playing grounds in their neighbourhood etc.

"The cars stink, it bothers me every time I cross the street".

"The Soy cake pollutes and stinks. I wish we could move it".

"Dumex stinks too".

"I hate the Soy cake, when the wind is easterly".

"The chlorine fumes escaping from the Soy cake are deadly".

"In the Baloon Park we are not allowed to eat the apples from the trees, but we do it anyway. It's like Tjernobyl".

"The Soy cake pollutes the water as well".

"In the yards all sorts of old junk is lying around".

"The dogs shit all over the place. It's disgusting".

In the pre-school class the children illustrated their conception of a local environmental problem in drawings/sketches.

After one lesson the teacher wrote down all the suggestions on a flip-over and we proceeded to the next phase: classification of the ideas into topic-groups.

During this phase all the suggestions were included without any judgment of whether they were suited as a topic for the whole class. Everybody was free to suggest anything and no comments were made from the teacher or the other pupils. We saw the immense richness of the children's conceptions and realized that these are often less limited by norms than those of grown up persons.

Phase two

In each class the teacher and the pupils discussed the statements and classified them into topics.

Classification of one grade-1 class:
The "Soy cake". Garbage and sick animals on the common. The dog shits. Unpleasant smell and smoke. Garbage in the Harbor.

Classification of one grade-2 class:
The "Soy cake". The Harbor. Dog shits. Water and purifying of water. Garbage.

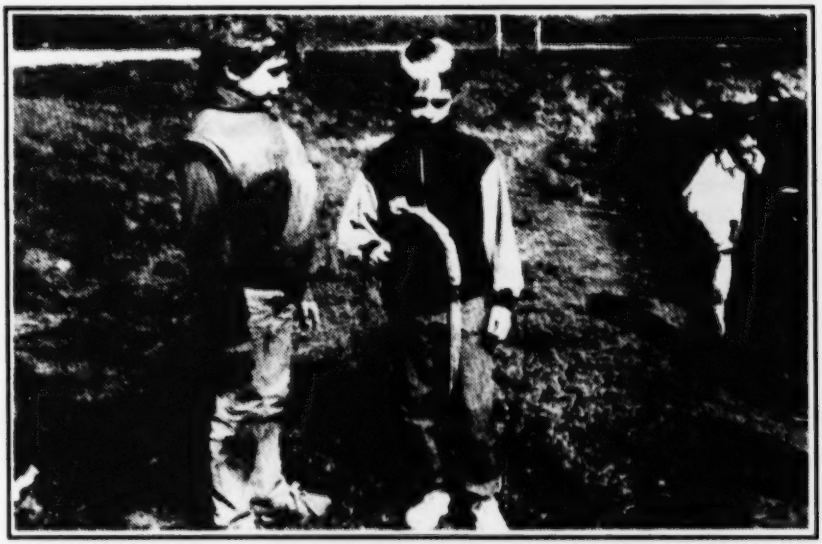
We noticed that many of the children, who had defended their own proposition, voted for a different suggestion in the end. They had obviously changed their minds during the discussion of the suitability of the topics.

Phase three

Each of the statements were discussed as to: possibilities of actions, suitability as a topic for a whole class and possible cooperation with other classes, the social/linguistic, the scientific/experimental and the creative and practical/productive aspects of the topic.

After the discussion of possibilities and perspectives of all the topics, the best suited was found by voting.

Pre-school class: Water pollution - bicycle wheels at the bottom of a pond.
Grade 1(u): Garbage and sick animals on the common.
Grade 1(v): The Harbor.
Grade 2(u): The Harbor - smoke and dust - cars.
Grade 2(v): The water.



We had not yet started the work on the project, when the children arrived one morning to tell us about heaps of dead eel, which they had seen in the moat. Some of the classes went to have a look at the eel the same morning. They were very excited by what they'd seen. One grade 1 wrote:

> "We saw a lot of dead eel. Some of the eel were blue. They were dead and they were in decay. Some of the eel had lost the head, and others had only lost the eyes. The water was red, blue, brown, and green. We also saw a small dog that looked like a fox. Thomas pulled the eel on shore with a stick. It was lying with the belly up."

After some discussion all the classes decided to look deeper into the matter of the dead eel, and this changed the point of departure for the project.

An example of a teaching programme in a grade two class

With a big majority grade 2 (v) had decided to work with the topic, water. The widespread interest in this topic may have been caused by a visit of a Greenpeace ship in Copenhagen. Many of the children had seen the ship take samples of the Harbor water. As a result of this Greenpeace was the subject of discussion for a while.

A quite different angle to the problem was introduced when two of the boys arrived in school one morning, and told us about the dead eel they had seen in the moat. The boys were very upset. The following day several of the other children had seen the eel and they brought newspaper-cuttings, and some had heard about the eel on the local radio broadcast.

The interest in the eel was big, so we decided spontaneously to look deeper into the matter. We walked down to the moat, shot some photos, caught some fish with a fishing net and took samples from the bottom. Back in class the samples were examined in a microscope and the results of this was written on the flipover. There were many signs of water pollution, but whether this caused the eel death, we didn't know.

The children's different ideas of the reason for the eel death were written on the flipover:

1) pollution,
2) garbage,
3) exhaust from cars,
4) smoke from the "Soy cake",
5) mercury,
6) the ice,
7) oil, gasoline, petrol,
8) old age,
9) barrels with poison,
10) lack of oxygen because of the thick layer of ice the previous winter,
11) the bottom had been frozen.

We tried to find viable explanations to the eel death in the children's suggestions and some were dismissed right away. The local newspapers pointed out different explanations. It was decided that teachers and pupils together should contact experts in the field. On the sug-

gestion of the children, we wrote letters to the local environmental authority, Greenpeace and the Harbor authority.

> Dear Charlotte
>
> We are a grade 2 class in Islands Brygge School and we work with the dead eel and we would like to know more about why they have died and the water in the moat and we would like an answer when you have time.
>
> Best regards
> grade 2v, Skolen på Islands Brygge,

During this session we talked about lack of oxygen and we set up a small oxygen-course to provide the pupils with knowledge about oxygen (for instance, a glass turned upside down covering a lit candle) because we think that an understanding of the concept of oxygen is necessary to understand a variety of environmental problems.

> Dear grade 2v!
>
> Thank you for your nice letter about the dead eel.
> I think it is bad that so many fish have died in the moat. We are trying to find out why and what to do about it.
> Another mayor, Gunna Starck, is examining the moat and the dead eel. Last thursday we talked it over here in the town hall and maybe your teacher will tell you about it (see the enclosed answers to question 344).
> I will send you some magazines which will tell you about how we try to stop the pollution (please see the enclosed "The road to a better environment in Copenhagen").
>
> Best regards
>
> Charlotte

In order to get a reasonable frame of reference we examined a pond on the common to see whether the diversity of species was the same as in the moat.

This pond was alive with animals. We brought the animals back to the classroom where they were studied and classified.

The names of all the species were written on the flipover:

In the moat we found:

a stickleback
dead eel
red worms

On the common we found:

frog eggs
water scorpion
ram's horn snail
water tiger
water spider
daphnia
pond snail

The pupils read about the animals they had caught - they made sketches and wrote about them, and the texts were printed and turned into a reader. To make them easy to see the sketches, the texts, the photos, the cuttings etc, were all hung on the wall.

We established an aquarium in the class room which contained the captured animals. The children were so fond of the aquarium, which may have been due to the contrast it represented to the dead eel, that we went to the common several times to collect more animals.

Parallel with this we renovated a pond at the school. This pond was dug out and prepared by another class some years ago, but now again it was overgrown. Those children who felt like it dug the pond out, removed the leaking plastic bottom and produced a new one. Water plants and turfs from the common were planted on the edges. Water was filled in and the animals from the aquarium were set out in the pond.

Evaluation.

The teaching covered 2-3 weeks and the children were very enthusiastic. We did not terminate the project with a ready and final explanation of the eel-problem. But it had been subject to much consideration and serious reflection. The pupils were able to discuss possible reasons and solutions and they knew that they had dealt with the problem in a qualified way.

The answers we received back from the various authorities and organizations created much excitement among the pupils. We gave a lot of thought to the fact that some of the answers were quite different from our own reasoning. Could we trust the answers we got, or were the answers attempts to conceal individual interests?

The topic has been very appropriate: it reflected the reality of the pupils' daily life, and it contained several possibilities for action at many levels.

Children and environmental problems

We have been particularly preoccupied with the question of how to work with environmental education in the lower grades. Is it a good idea at all to work with a local, contaminating, and dangerous place of work?

The general attitude towards this question is that environmental education in the lower grades, should mainly provide the children with nice and positive experiences of nature. One essential aspect of this attitude is that children need to feel familiar with nature, which also implies getting the courage to touch nature - an earthworm for instance. It is argued that the environmental education should not involve environmental problems as defined by adults - this will leave the children scared and paralyzed, as they are not in a position to solve the problems.

So far we agree. We don't want to impose our adult conception of the environment on the children, neither do we want to impute problems to them which they can't cope with. But the children's conceptions of a local environmental problem, show us that they are acutely aware of the fact that the "Soy cake" pollutes and is a dangerous neighbour! Quite a few of the remarks suggest anxiety on the part of the children:

> "The "Soy Cake" is next door neighbour to my nursery school. The smell is so bad that I get scared".
>
> "If the "Soy Cake" leaks you can die. They don't always sound the alarm when it leaks"
>
> "I don't like to hear about it".

The question for us is not to introduce a local environmental problem, which will scare them. The thing is that children *are* scared. We have reached the conclusion that it takes pedagogical discretion to include environmental problems in the teaching, but also that it is imperative. We have to give the children fair information, but only information that is relevant to the chosen topic. Our task is not to try to remove the anxiety in connection with the plant by faulty information like: "They'll

probably move the chlorine plant soon", but to have the children articulate their feelings and conceptions of the plant.

It is important that the children get the chance to work actively with the fear that has grown out of the existence of a local environmental problem. But there must also be room for nice and positive experiences of nature, and that led us to the renovate the "home made" pond, where teachers and pupils together created a nice environment for the aquatic animals.

We are convinced that the prevailing conception of small children and environmental education has to be questioned. We do not agree with the attitude that you should avoid local environmental problems if the children are left without the possibility to act on them directly. Basically, children's knowledge about, and feelings for, a local environmental problem include concepts that are identical to those of grown up people. This is the fundamental understanding in our environmental education.

The demand that a topic must be oriented towards action does not imply that children change society. Obviously, they are not in a position to do that, and they are not supposed to try. On the contrary, it is a demand that children learn how to get round in society, identify problems, and ask questions to the way society is organized. Not until then can we claim that we "prepare pupils for taking an active interest in their environment, for participation in decision-making in a democratic society, and for a share in the responsibility for solving common problems." (Education Act 1975).

The teachers of the project and authors of the report "Skolen på Islands Brygge": Marianne Skensved, Helle Vinterborg, Michael Olsen, Per Støvring.
DLH-adviser: Per Støvring

Concluding comments

The twenty-three projects cover highly different conceptions of nature, ranging from the viewpoint that nature is what is untouched by human hands, to the viewpoint that nature is everything. The conceptions of man's relation to nature and of the ideal character of that relationship are different, too. For some, nature is static and has to be preserved by preventing human interference. For others, nature and society are inseparably bound up with each other in a common development and this development, which has to be directed by man.

The implication of various social interests in the character of the man-nature relationship, has been emphasized as a central issue in environmental education, but it has proved difficult to work with contradictions and conflicts in the teaching. To avoid problems, some teachers have *consciously chosen* not to take up a local conflict as topic for their environmental education. Other teachers describe that the class *did not 'come across' contradictions* during the work with the chosen environmental problem. Several descriptions reveal that the pupils were often *very aware* of conflicts, but the conflicts were rarely touched upon by adults, neither in school nor at home.

In one case the pupils show a direct and strong fear in connection with a local environmental problem, and it is emphasized that positive experiences of nature will not do for these children: if the fear is present, it must be dealt with in the teaching.

It is apparent that the environmental education has been qualified by the placing of the teaching outside the school, and from the cooperation with various authorities and individual persons from the neighbourhood. To work with the surrounding locality has not created the kind of problems, which is usually anticipated in the pedagogical debate.

In most projects teachers with different training background were involved. To draw in the different subjects does not seem to have caused appreciable troubles. A common feature in the projects has been the spread over many subjects, but in general the social analyses do not seem to have reached great depths.

It was anticipated that the problem-oriented teaching would be difficult, and many of the projects did get the character of traditional

topic-oriented teaching. But still, there are many examples of projects, where the point of departure for the environmental education, was the pupils' own phrasing of the problems. This kind of teaching demands a different role of the teacher, and many teachers seem to have had difficulties in changing their way of teaching.

The aspects of action have played a prominent part in the projects, and the actions have been very varied. Contact to authorities, public exhibitions, distribution of posters, newspaper articles, appearance on TV, as well as more tangible actions like cleaning of the beach, the sorting out of the school- chemicals, and nature nursing. In some projects the topic (e.g. rubbish, recycling) has been chosen with a view to the possibility of actions. In these cases the evident tendency has been that the social aspects were thrown into the shade and the problems individualized.

Introduction to the Danish Environment and School Initiatives

Lecture given by

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The Danish Environmental Education Project.

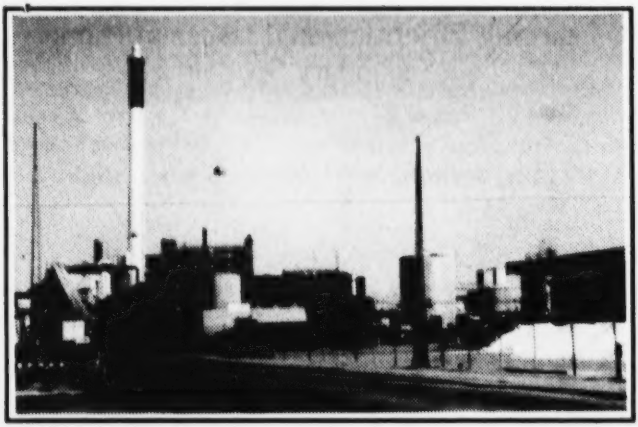
The Danish projects in environmental education have been carried out at 22 schools, involving 35 school classes all over the country. The projects aimed at gathering experiences as the bases of in-service teacher training. All class levels from pre-school class to 16 year olds have been involved and a variety of environmental issues have been dealt with.

In the following I shall only refer to two schools i Copenhagen and two in Jutland.

In the Danish project, we are convinced that working with conflicting interests is a central part of environmental education. Very often people tell us that they don't see any conflicts or at least, you should not bring them to small pupils.

I have decided to limit this introduction to a few but very important aspects: The student's conceptions of environmental problems and different kinds of environmental consciousness resulting from education. This will be linked up to the importance of experiences of nature for the children's environmental consciousness.

One of the schools is situated in the close vicinity of the Harbour of Copenhagen and the Soy Bean Cake Industry, a plant producing among other things the deadly poisonous chlorine gas.



The slides display the chlorine plant, the nursery school and housings of the school district. The school is situated some 500 meters from the nursery school, and as you can see from the pictures the chlorine plant is a very conspicuous neighbour.

The project was carried out with young children, age 6-9. In all the classes the pupils were asked to give their opinion on a local environmental problem by finishing the phrase: "It's too bad that.....". Some of the pupil's phrasings are shown in the next slide.

Teacher: "It's too bad that ....."

Pupils:

"The chlorine fumes escaping from the Soy Cake are deadly".

"In the Balloon Park we are not allowed to eat the apples from the trees, but we do it anyway. It's like Tjernobyl".

The "Soy Cake" is next door neighbour to my nursery school. The smell is so bad that I get scared".

"If the "Soy Cake" leaks you can die. They don't always sound the alarm when it leaks"

"I don't like to hear about it".

Obviously, these pupils are conscious of the problems and conflicts in their local environment. They are scared, but they have been able to reflect on the problems and they need to talk about it.

The teachers concluded:

"The general attitude is that environmental education in the lower grades, should mainly provide the children with nice and positive experiences of nature. It is argued that the environmental education should not involve environmental problems as defined by adults - this will leave the children scared and paralyzed, as they are not in a position to solve the problems. So far we agree. We don't want to impose our adult conception of the environment on the children. But the children's conceptions of a local environmental problem, show us that they are acutely aware of the fact that the "Soy Cake" pollutes and is a dangerous neighbour! "

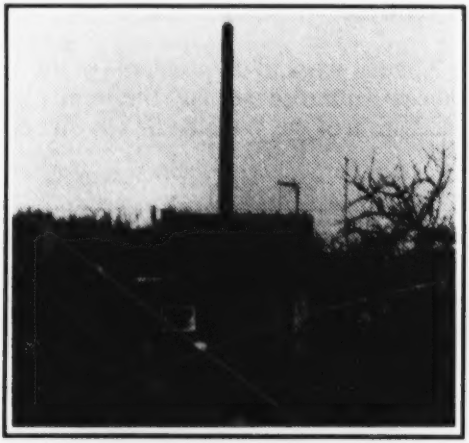
A sudden death of the eel in the neighbouring moat attracted the attention of the pupils of grade 2. They investigated this problem for a while and ended the project with the positive experience of making their own pond on the school ground.

The example of the "Soy Cake" may be extreme, but very often children feel insecure about environmental problems.

The grade 2 pupils from Herlev skole also display the understanding of conflicting interests in their local environment. One of the pupils writes about his local playing environment:

> "It's boring.
> The local authority decided that
> there should be placed a bicycle
> track in stead of a playing ground".

The pupils visited some of the local allotment gardens located just next to a large industrial area on the top of an old dump.



This is one of the gardens. Several of the pupils knew about allotment gardens located along motor roads, dumps and similar places.

Teacher:

"Why are the allotment gardens located like this?"

Students:

"The land is cheap".

"The local authority is more concerned about the money from the big factories than about the desires of the allotment garden people".

These are rather clear sighted statements from 8 year olds.

In the two former projects, the conflicts were the starting point.

The two projects in Jutland started with good experiences of nature as an introduction to the work on man-nature relationships, yet they ended rather differently.

In Tønder grade 7 pupils worked on problems of the Wadden Sea. The project was a success in the sense, that the pupils became very concerned with conservation of the Wadden Sea as you can see from some of their writings:

"Since the Wadden Sea is the habitat of many birds and other animals it is obvious that it should be conserved. This is why I think that it was ridiculous to build the protruding dike and make fields where the tidal flats were located before. Those fields are not of vital importance for us as the tidal flats are to many species of birds, worms and snails".

"It is clearly very important to conserve the Wadden Sea. But a lot of people don't know how to use the Wadden Sea. Very often they are destroying it in stead of conserving it. The tourists drop rubbish in a careless way and the big ships pour oil into the water and the numerous factories allow the waste water to run".

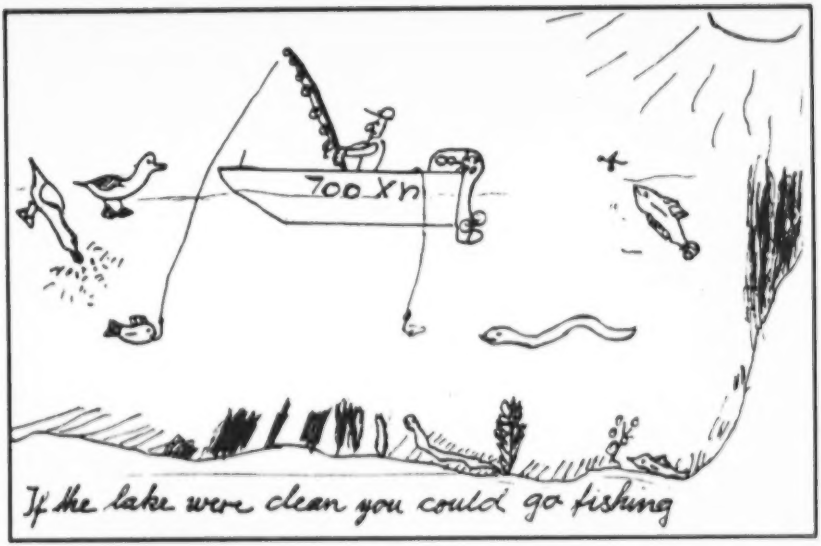
During the educational process the Wadden Sea has been emphasized as a unique area in which the organisms are extremely well adapted to the environment. The pupils experienced the Wadden Sea as something very beautiful and outstanding. But somehow man appears as the destructive intruder against whom The Wadden Sea must be protected. Anyway, the area should not be open to tourists. The attitude is almost misanthropic.

This kind of environmental consciousness is quite usual among environmentalist movements and a great part of the population, at least in Denmark.

The grade 5 pupils in Herning had a magnificent experience of nature at the surroundings of a small lake. Later on, they realized that the lake is heavily polluted by waste water from the city of Herning. They found out, that in the old days the eel fishing was good, people went there for picnics and they sailed on the lake.

After finishing the investigation of the lake, the pupils made proposals for the future use of the lake. Everybody agreed that pollution had to be stopped and the lake cleaned up. A proposal of turning the lake and its surroundings into a natural reserve was rejected, and alternatively, they suggested that the lake should become a location for picnics, bathing, fishing and sailing. And may bee a nature school could be built.

Some of the proposals are displayed in the following slides.


700 Xn
If the lake were clean you could go fishing

You could go camping
and sailing

In the utopian thinking of these pupils the relation between man and nature (the lake) is something of positive value and the fate of people and the lake is united. The pupils have gained environmental consciousness, but not in the same way as in Tønder.

In both the projects the pupils had good and positive experiences of nature. From my point of view, these experiences were very similar in the two projects, but the educational processes have been carried by different views of nature: One of conservation and one of reasonable development.

Which kind of environmental consciousness are we going to choose?

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Christensen, C. U. & Nielsen, K. (red.) (1988), Eksempler på miljøundervisning, Geografforlaget.

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Sustainable Development and the Ideological Foundation of Environmental Education.

Lecture given by

Søren Breiting
Institute of Biology
The Royal Danish School of Educational Studies,

At the conference:"Sustainable Development - learning for Tomorrow's World. Environmental education seen in the light of the recommendations of the world commission for environment and development.

International Union for the Conservation of Nature and Natural Resources

Bø, Telemark, Norway 8th-10th June 1988.

Sustainable Development and the Ideological Foundation of Environmental Education.

I shall start talking about environmental education,- not about the Brundtland report.

In general we can say that both elucidating values and questioning and discussing values, must be an important part of environmental education on all levels within education.

On the other hand environmental education builds on values deriving from the underlying motive for our efforts concerning the development and promotion of environmental education.

These I call the ideological foundation of environmental education. - If environmental education does not build upon them, environmental education has no meaning.

Fig. 1

"When you work for environmental education do you then work for *conservation of the past* or *development of the future*?"
This is an essential question when we discuss the potential of environmental education in the light of sustainable development from the Brundtland Report.

Different people and organizations might have different motives for their efforts in regard to environmental education, and thereby different ideological foundations for their version of environmental education.

For example, when you work with environmental education do you then work for "conservation of the past" or "development for the future"?

In my view environmental education must be build on the following values.

1. A "healthy environment" must be ensured as one of the conditions for human health.
2. Equality among all people, including acceptance of equal rights for all people to have their share of the utilization of natural resources.
3. Man's use of nature to-day must not lead to irreversible damage to future generations' use of nature.

The point is, that even though the educational work must build on these values and be in continuation hereof, the discussion of these values must be a central part of what to do in environmental education, too. This might sound as a paradox: We build on these values in our efforts to promote environmental education, and at the same time, these values must be exposed to open discussions while teaching.

This is because the "new generation of environmental education" have not behaviour modification but action qualification as a goal, - as I see it. I shall return to this subject later on.

First let me elaborate the three mentioned values a little further, and I start with the second one: Equality.

This value has not been in focus in the debate of environmental education and many may say, that it sounds pleasing, but they might still have the opinion, that this is an irrelevant part of the ideological foundations of environmental education.

But is it not so, that even during heavy suffering from environmental degradation in an area, it will always be possible for some people to escape the negative consequences of the environmental degradation and get what they need? Therefore we need this value. It points to the democratic rights of all people within each country and between

countries, and it puts focus on the need to build upon the democratic playing rules in our struggle against the environmental degradation.

As the first value I stated "a healthy environment" in connection with human health. Human health is here used as the broad concept of health, much like quality of life. It incorporates physical as well as, psychological and social aspects.

In my opinion it is impossible to carry out a concept of a healthy environment alone. We cannot go to nature and look for healthy environments without coupling the concept of a healthy environment with a concept of human health. A healthy environment is an environment which promotes human health.

It has been said that the aim of environmental education is to create environmental literate persons, and the superordinate literacy component has been formulated in the following way:

> "The environmental literate citizen is able and willing to make environmental decisions which are consistent with both a substantial quality of human life and an equally stubstantial quality of the environment. Furthermore, this individual is motivated to act on these decisions either individually or collectively."
> (From Harold R. Hungerford and R. Ben Payton).

The formulation here of "quality of life" is comparable to health. But this formulation will give some difficulties: How is it possible to determine what is the quality of an eutrophicated stream without relating it to the quality of human life? Some animals and plants will flourish during the increasing fertilization process. Others will die out from the stream. We can neither use the concept of a healthy environment. And there are no help to find in an idea about "the healthy environment" being the same as "the original environment" for two reasons:

First: the original environment in the pure sense does no longer exist on this Earth. All parts of the environment are influenced by man to a greater or smaller extend.

Second: even nature without human interference is dynamic, too: a stream will change during the centuries by natural processes.

Looking again at the literacy component of Hungerford and Payton it would - as I see it - have been much more useful, had it focused on a value balancing the quality of life of present populations with the quality of life of future generations. And I take the liberty to replace quality of life with health. Environmental education would then have to focus on the question: what are healthy environments today and what should they be in the future. There are indeed many deep conflicts between our problem solving today and what will be the interests of the next generations.

This brings me to pointing out the essential interrelationship between the three already mentioned values. Which to put it shortly might be expressed as *a concern for all people now and in the future.*

Fig 2. The essence of the ideological foundation of environmental education is a concern for all people now *and in the future.*

The third value "Man's use of nature today must not lead to irreversible damage to the use of nature of future generations " build on the following recognitions:

What we do today have implications for tomorrow - and most important, for the living conditions of the next generations.

And it is unsuccessful parents who give their children and grandchildren lesser opportunities, than they started with themselves.

On the other hand we must recognize that man has always altered the environment, and will do this in the future, too. The important

point then is: that mans activities must not result in irreversible damage.

As you see, I avoid looking for values in nature. Nature is of enormous value to man and that is a sufficient recognition. Just remember how central a role for the "values in nature", the concept of "diversity provides stability" played in the environmental movements until is was discarded as scientifically unsupportable.

In nature conservation in the broader sense, the concept "sustainable use" has been developed following the recognition, that man necessarily has to use the natural resources. I think, that the concept "sustainable use" is still a useful concept, also from a pedagogical point of view and I will therefore comment on that:

The concept sustainable use is referring to man's exploitation of populations of plants and animals. The exploitation is sustainable only, if it does not damage the possibilities of future generations to make use of the resources. It evidently means, that the exploitation is sustainable, only if all kinds of - for example - man induced extinction of species are omitted.

But it also means, that all other kinds of reductioning the broad genetic spectrum of populations are omitted. - No "genetic erosion"!

The concept of sustainable use also includes none living, renewable resources like groundwater and the agricultural use of soils. But is it sustainable use of soils, if the agricultural practise influences the groundwater and in that way spoils the drinking water or at least reduces its quality? I think, that in this case the agricultural practice is not sustainable. The concept of sustainable use must then incorporate the influence of other resources, too. So we have the direct effect of man's use of the resources in question, as well as the indirect effects on other relevant recourses. Another well-known example is, that logging of tropical timber often results in permanent loss of forests and extinction of animals.

Logically the concept of sustainable use of a single resource can be extended to deal with the exploitation of entire ecosystems.

From a pedagogical point of view the concept of sustainable use has a number of advantages: It focuses directly on the man-nature relationship, with a perspective on the future. Is is a normative positively loaded concept, contrary to so many negative concepts which the students work with in environmental education: pollution, overgrazing, extinction and so on.

If sustainable use can be incorporated in the syllabuses of universities and the like, this will be one of very few examples of incorporation of normative concepts in the sciences. (One of the other concepts are "health".)

Fig. 3 Where in the world do we find exploitation of resources that have not already given irreversible changes?

I hope that the former statements of sustainable use sounds reliable. But a little reflection will point out some problems:

Where in the World do we find exploitation of resources, that have not already given irreversible changes? Our use of fossil fuels is of course irreversible. And will the clearing of the forests for agricultural purpose in the temperate zone, anywhere be possible - just in theory - to change back to the original woodlands? Where in the tropics, with agriculture, that has proved sustainable for centuries, have the original fauna and flora not suffered, by reductions in genetic diversity? All in all we must recognize, that an absolute requirement for sustainable use, will be impossible to fulfil.

From this, we should not jump to the conclusion, that sustainable use is useless in education. I think, it is sustainable. We must be aware of the very important character: the relativity of our central concepts: health, healthy environments and - sustainability. We must work for the healthiest people, for the environments, that best promote healthy

people and we must always select the methods for the use of natural resources which are the most sustainable. In our evaluation of different methods of use, we must always compare them with our ideal of sustainability to find the best and we must avoid giving the methods a ranking like the ideological foundation.

It means for example, that the methods of reducing the amount of waste by reuse and recycling - which to us today sounds as the only sensible thing to do - always in our teaching must be regarded as *methods* to solve the waste problem and not ideals in itself for man's use of nature.

To put it in another way: We must be very open-minded in our ways of teaching. There are no authorized way to solve man's problems in his use of nature and there will always be a lot of conflicts and no simple solutions.

II.

When we turn to the Brundtland report, it contains things which are in common with what I have said until now, and there are differences.

At first we must of course always be aware, that the Brundtland report is not a pedagogical blueprint. We all know what it is instead.

As educators we must ask: "How is the Brundtland report in comparison to our ideological foundation of environmental education, and what can we in general learn from the report?".

The key concept in the Brundtland report is sustainable development. This means a development which satisfies all people's fundamental needs, without spoiling future generations' possibilities for satisfying their needs and hopes. The report therefore focuses on developmental mechanisms which promote equality in the distribution of the resources, between countries, as well as inside each country.

In general there are no conflicts between what I outlined as the ideological foundation of environmental education and the ideology expressed in the Brundtland report.

The Brundtland report does not give the health concept an equally central placing, but talks much about people's fundamental needs and hopes.

The report discusses a lot of economic mechanisms and their influence on the development. The report builds upon a consensus about economic growth as an essential part of sustainable development. Many of the statements and conclusions of that kind from the Brundt-

land report, I will categorize as methods which we must not give status as a part of the ideological foundation of environmental education.

III.

The Brundtland report calls for "action now". It requires better cooperation in general to promote the message of the report and proposes concrete initiatives from international institutions and conventions. Especially it calls upon the United Nations General Assembly to use the Brundtland report as a programme for sustainable development.

But in regard to pedagogical work this sort of action is of course not enough. We need to engage our students in action.

Fig. 4 The new generation of environmental education has not behaviour modification as a goal, but action qualification.

In the beginning I stated that "the new generation of environmental education" has not behaviour modification as a goal, but action qualification. By that I mean that the former times' educators and conservationists felt, that they knew rather precisely what the students

should learn about "how to behave". Now many of us know, that it is more important to qualify the students' own way of thinking and acting.

The pedagogical way of discussing actions and teaching has at least resulted in four different meanings: (see fig 5).

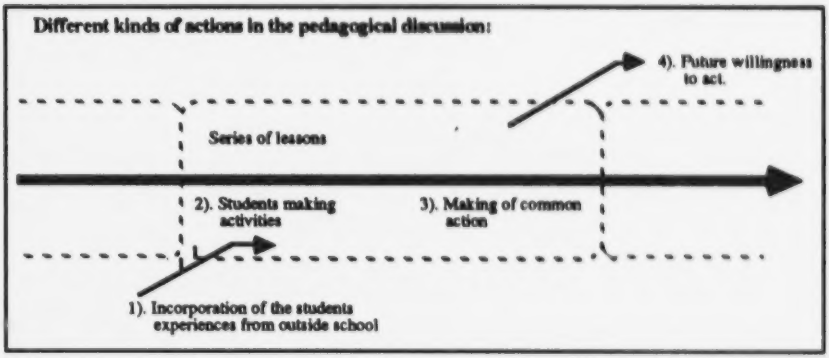
Different kinds of actions in the pedagogical discussion:
4). Future willingness to act.
Series of lessons
2). Students making activities
3). Making of common action
1). Incorporation of the students experiences from outside school

Fig. 5. A simplified model of some concepts of actions which have been incorporated in the pedagogical discussion of environmental education. The main arrow represents time and points to the future. The broken lines outlines series of lessons dealing with a topic on environmental issue.

1) *Incorporation of the students' actions and experiences from outside school in the lessons.*
2) *Making activities during the teaching to stimulate the engagement and learning of the students during the teaching.*
3) *Ending the course of an environmental issue by planning and making some sort of common action to make the situation better.*
4) *Emphazising the students' future willingness to act and take the environmental aspects seriously.*

The fourth way of thinking about action is superior to the others and is normally regarded as a part of the goal of environmental education. I will therefore end my contribution by drawing your attention to some of the factors, that might influence peoples responsible environmental behaviour:

According to a proposed model by Hines, Hungerford and Tomera the factors which influence our intentions to act in an environmental responsible way, might be listed as: (see fig. 6) *a number of personality factors, our knowledge of issues, our knowledge of action strategies and finally, our action skills.*

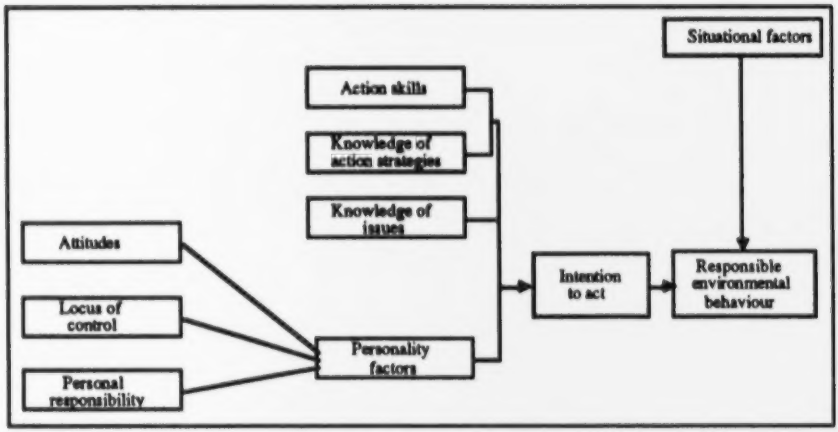

Fig. 6. A proposed model of factors influencing "responsible environmental behavior" from Hines, Hungerford and Tomera (1986/87).

We know very little about the interrelationships between these factors, but we know on the other hand, that situational factors in the specific situation often modify our intentions to act.

Environmental education has, up to now, often drawn much attention to the students' attitudes and knowledge of issues. We know, that in general, the effect of more knowledge about environmental issues often give disappointing results.

In conclusion we may very well ask each other:

If we agree that the concept of sustainable development fits in with the ideological foundations of environmental education, how then, can we help students promoting and qualifying their actions to promote sustainable development by practising knowledge of action strategies and action skills? And how can the relevant personality factors of the students be stimulated during their teaching experiences?

Without trying to give any conclusive answers to these questions, I would like to mention a few findings, which might be of interest to you.

Nature experiences for children has been much in focus in connection with conservation education. In my opinion we shall not underestimate its later value for the grown-ups but on the other hand we must not overemphasize its sustainability in environmental education. Often a sort of nature naivism will be the result of overwhelming nature experiences if the energies derived are not qualified in a more community realistic sense. In the shown model, nature experiences will influence the personality factors.

Fig. 7. Often a sort of nature naivism will be the result of overwhelming nature experiences if the energies derived are not qualified i a more community realistic way.

The locus of control concept draws the attention to the individuals perception of whether or not the person has the ability to bring about any change through the person's own behaviour. The term external locus of control is attributed to persons who do not attempt to bring about any change because they feel, they have no influence. In envi-

ronmental education it is of course important to promote the students perception of an *inner locus* of control which means that they believe that their activities are likely to have an impact.

If we during teaching only focus on the global environmental problems it might be difficult to achieve results which reinforce the students inner locus of control. But even if this points to problem solving in a very small scale, we must not only focus on individualized actions like buying recycled paper. The actions on a social level is very important, too.

In the school, as well as in later education we have focused so much on knowledge of issues. Very rarely do we work with action skills in theory and practice. The model implies that this should have a prominent status in academic careers, too. This means that we must work for the substitution of some of the factual contents with project work which emphasizes action strategies in theory as well as in practice. For many academics this might sound like a revolution.

In reality it might be a way to strengthen democracy.

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Education, the Disciplinary Institution and Perception in the Management of the Environment in a Democratic Society

Paper presented to

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Study Group:
The Role of Environmental Perception in Resource Management

by
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Education, the Disciplinary Institution and Perception in the Management of the Environment in a Democratic Society

Abstract

In a society such as Denmark resource management is ideally an expression of the democratic process. It is in this spirit that Danish law stipulates, that the citizenry must be consulted when local and regional plans are promulgated. The character of public influence on resource management is an expression of public perceptions of the nature of environmental problems and their solutions. This is an area where the school as a civic institution, and geography as part of that institution, are expected to exert an influence. What determines, however, the perceptions which school geography directly and indirectly communicates?We will seek to provide some answers to this question based on our experience in developing programs for environmental education in the Danish schools.

In the course of our work we have observed how a number of internal and external conditions (institutional, political and academic) control and define the means, ends and results of environmental education, and thereby come to exert influence on the environmental perceptions of the pupils. We will seek to elucidate these issues from two perspectives:

a. The content of environmental education, and the disciplinary institution.

b. Education for democracy with democracy: the perception of conflict vs. that of social and natural harmony.

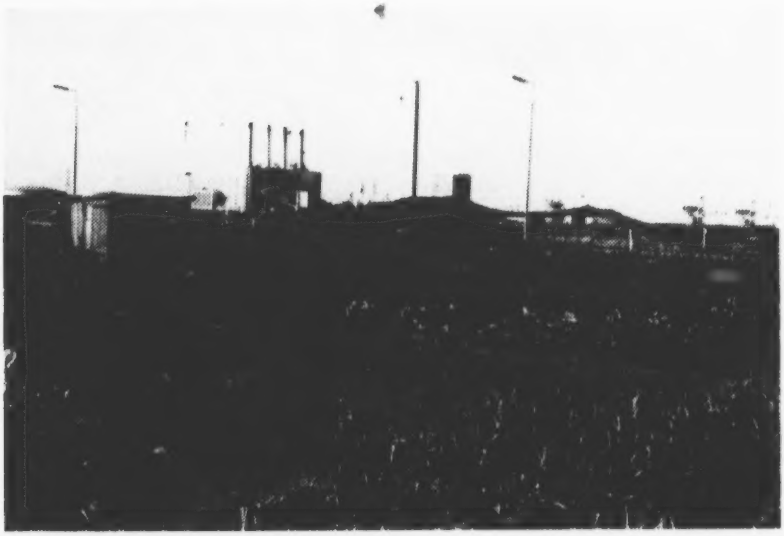
Geography: an academic discipline and a social institution

Geography can be viewed both as a "disinterested" scholarly study - a science, its freedom of thought protected by academic freedom - and as a "socially constructed" academic institution serving and reflecting the various interests of power in society. Even though the two roles are somewhat opposed to one another, geography will necessarily and unavoidably manifest both aspects. This is because it is difficult to conceive of the existence of a scholarly discipline which is not rooted in some institutional setting - such as that of the university - which owes its existence to sources of power external to the institution (Lyotard 1984).

When geography is viewed as a disinterested scholarly pursuit, as a science, its practitioners can be seen to be attempting to develop an intellectual instrument (the discipline) through which one can, with minimal distortion, view and analyse the workings, and perceptions, of society and its environment. When viewed as a social institution, on the other hand, the discipline itself, the very way it is structured and its content defined, can be seen as representing a perception of society and its environment; a perception which a specific, historic constellation of power mandates. Despite the obvious contradictions between these two roles, there is nothing that is per force, unethical about the field's institutional role, so long as the practitioners of the discipline are ethically in agreement with the way this institutional role is defined. This dimension first becomes questionable when the members of the discipline ignore, or do not concern themselves, with the institutional role of the discipline. Science cannot fundamentally transcend, either morally or epistemologically, the society of which it is a part. For our part, we are quite able to live with the dual role of geographic scholar and educator within and for democratic social institutions.

Danish Democracy and Danish Education

Danes often express pride in their democracy, also through their electoral behavior - 85-90% of the adult population normally votes in a national election. Though the absolute monarchy (a so-called "enlightened despotism") was (peacefully) overthrown in 1848, full parliamentary democracy was not achieved before 1901, and a royal pre-empting of the democratically elected government was attempted as recently as 1920. The Nazi occupation was proceeded by a period of widespread dis-satisfaction with democratic values. The achievement of un-contested democratic rule is thus of such recent memory that democracy is not taken for granted, but highly valued by those who have fought for it.



The Asnæsværk powerplant near Kalundborg. Danish law stipulates that the citizenry must be consulted, when local plans are promulgated. The character of public influence is an expression of public perception of environmental issues. In this case there is a conflict between the need for small gardens, homegrown vegetables and the need for electricity with the resulting physical and aestetic pollution of the atmosphere and the landscape.

Denmark is in many ways an ideal social laboratory in which to study the role of geography as both a scholarly discipline and a social institution and, hence, to study the ethical values attached to work within that institution. As part of the heritage of a highly centralized monarchy, Denmark maintains a state university system which, to this day, is slotted to the needs of the state, particularly the state civil service system (including the clergy in the state church). The size of departments and the number of students allowed to attend thus are limited to the estimated need of the state. Within the system of higher education, an autonomous system of teacher's colleges, educates teachers, and our institution, *Danmarks Lærerhøjskole,* is its (post)graduate school. The "liberal arts" tradition in education is limited in Denmark primarily to semiprivate "folkehøjskoler" which offer courses of a usual maximum of six months, and which may not, by law, offer degrees. The institutional role of education is thus clearly defined, and not easily mistaken.

At the university level it is only within the past two decades that the autocratic rule of the professor (a civil servant) was replaced by the system of peer evaluation and democratic control which is familiar to most Anglo-American scholars. This same time period has seen a liberalization of access to higher education and a general democratization of all levels of the school system. Because the system of higher education is entirely in the hands of the state it is still highly vulnerable to control when the central authorities perceive it not to be living up to its institutional role. Politicians can and do take an interest in the content of the scholarly disciplines at all levels. In a recent report on Scandinavian geography in *Progress in Geography* the present right wing government's promotion of a natural science orientation to geography is described as "causing great concern among Danish human geographers regarding the survival of human geography as a social science subject, due to the government policy of reducing public expenditures in general and its attitude in that respect towards the future of human geography specifically" (Asheim 1987:349). The fear is well justified, the department of geography at Aarhus University has, for example, recently been closed by a central state authority, under the minister of education, possibly to be replaced by a department of mathematical planning.

This state involvement in the formation of the character of scholarly disciplines, though a violation of the liberal tenants of academic freedom, does have a positive side. It has the desirable effect, paradoxically, that such institutional issues become quite visible and open to debate in the public and academic forums. These issues, such as they are manifested, for example, in the role of the natural sciences in environmental education, are apparently no less pressing in societies where the ("repressive"?) tolerance of academic freedom is more pronounced, but they tend to be less visible and thus tend to go unexamined either in public or academic discourse. The effect on the content of education, however, seems to be no less marked (Pepper 1987).

Geography, Environmental Education and Democracy

Our professional activities take place within a clearly defined institutional context. We provide in-service training and advanced degrees for elementary and secondary school teachers, and, in the course of this work, we also engage in curriculum development as it relates both to our own curriculum, and to that of the teachers. Our students, in their work as practicing teachers, are defined as disciplinary scholars who, at the metho-dological level, have complete instructional freedom. On the other hand, however, they are constricted with regard to the content of their teaching by the law of the state which broadly defines the discipline, and by a "suggested" state curriculum which, if approved by the local authorities (which it usually is), defines the discipline in greater detail. Furthermore, the teacher must conform to the overall goals of the state education act. In this act it is clearly stated that the goal of education is to foster the civic democratic institutions of the state.

A primary goal of our work has thus been to foster the ability of the pupils to comprehend and engage in the democratic process both as this process is manifested in the school room (pupils have a legal right to influence the content of their education) and in society at large as future citizens. Through this work it has become increasingly clear to us that the disciplinary content of environmental education of itself represents a mode of perception; a means of structuring students' view of

fundamental relations between people and their environment. This structuring, in turn, is of vital importance to the positive or negative role which the discipline can play in the democratic process. A form of environmental education, for example, which creates the impression that science is an absolute authority in environmental issues (whereby science is fetishized and mystified) can potentially provide an ideological legitimation for a technocracy in which citizens passively defer to the "objective" wisdom of specialists (Pepper 1984; Mercer 1987). A form of education which, on the other hand, views science within a social context can foster a willingness on the part of the individual to engage in an independent personal evaluation of the arguments presented in the context of a given environmental issue.

Environmental education

The tendency has been for environmental education in Denmark to be dominated by the natural sciences, particularly biology. This, in itself, reflects the institutional structure of the public school system where specialized teachers traditionally instruct in particular subjects - much as in an American High School or College. In and of itself this system tends to lend authority to specialized disciplinary approaches which appear to provide "objective" and incontestable (absolute) and hence not controversial forms of knowledge. It is, of itself, a system which constricts the possibility for more relative and generalized inter-disciplinary approaches which, per force, involve differing perspectives, and hence controversy. Given such a system, the physical sciences will tend to dominate an area of study which focuses on the physical environment. Though the system is now evolving towards a less specialized educational structure with fewer teachers (particularly at the lower levels), school teaching at all levels still tends to reflect particular disciplinary views and to defend particular disciplinary interests, including interests of a nonacademic nature such as, for example, employment opportunities within the field, textbook publication, etc.

Our development of a program for environmental education has taken place within the context of a common research program which has had the goal to:

> Contribute to a development in the schools which increases the pupils' awareness of the interaction between society and its physical environment. This awareness should be treated as a general challenge to the school and not as an educational content which is solely the provence of a single school discipline.

On the basis of this broad approach to environmental education we were active in the formation of an interdisciplinary environmental education working group, at our institution, comprising both the natural sciences (biology, physical geography, physics, chemistry, nutrition and health) and the human sciences (sociology, human geography, philosophy, education). In the course of the past few years this group has been actively engaged on the theoretical and practical level in the development of an interdisciplinary, problem centered curriculum for environmental education. Our activities include the development and evaluation of an interdisciplinary course of study for teachers; the organisation of twenty three locally generated interdisciplinary pilot curriculum development projects; the publication of a textbook providing varying perspectives on the subject and the promulgation of a forthcoming nationwide study course for teachers on the subject of environmental education (see appendix).

From a disciplinary point of view, we, as geographers, felt that we potentially were in a unique position to contribute to such an interdisciplinary approach because our discipline involves the natural sciences, the social sciences and the humanities. This meant that we were predisposed to broaden the disciplinary basis for environmental education. As we have an excellent working relationship with the biology department at our institution (geography, biology and history are often taught together in Denmark), we had no problem reaching agreement with our colleagues regarding the desirability of this goal. Our point of view, however well grounded it was in the international development of geography, nevertheless constituted a challenge

to the version of our discipline which has been institutionalized in the official Danish curriculum, which was last revised in 1976. This curriculum is rooted in the tradition of dividing the discipline into autonomous general, systematic, disciplines (demography, resource geography, political geography, economic geography, ad infinitum) which are only joined together by their supposed ability to illuminate the situation of a specific given formal region. This means, in effect, that the physical and human science dimensions of the discipline are not integrated at the theoretical level - at least in-so-far-as modern scientific epistemology is concerned. This mode of disciplinary organization stems from Bernhard Varenius (1622-50) and thus reflects the "classical" concept of science as process in which phenomena are classified within preordained, teleologically a priori taxonomic patterns - in this case the pattern of regions (Foucault 1973:125-65).

Despite this disciplinary framework a certain degree of integration, in the modern sense, within physical geography was nevertheless provided for by the introduction of the subject of landscape ecology which describes the abiotic physical environment as being built up of geosystems (energy- and material transport systems). This approach takes into account the influence of society upon these systems, but only from the perspective of the physical environment. It does not concern itself with why society relates in a given way to its environment, why it has difficulty preempting environmental problems, or how it determines what is to be regarded as desirable environmental quality.

This form of geography, in our view, fostered a status quo perception of society-environment relations which only could be understood in terms of "objective", "value-free", systematic scientific specialisms within limited "regional" contexts. This did not conform to our educational goal which was to foster the development of an independent minded democratic citizenry which was not afraid to question the assumptions of a given order. We judged that since the present interest in the environment stems from the problems and conflicts of interest which emerge for society from its process of interaction with its physical environment - both locally and globally - the best way

to provide a unified understanding of the forces molding society/ environment relations was to focus on the character of these problems (see Pepper 1987 for a similar view). In so doing, we felt, the basis for the integration of the natural and human science dimensions of the discipline would become apparent. In the following we will sum up our experience from this work as it applies to the relationship between the scholarly discipline and democratic institutions.

One way to counteract the common "status-quo perception of society-environments relation" as being an area beyond the influence of the general public is to give the pupils the opportunity to act in an untraditional way. These pupils from a schoon in Esbjerg performance a drama for a better environment.

Education for democracy with democracy: the perception of conflict vs. that of social and natural harmony

The Danish state school system, by law, must educate pupils for democracy by practising democracy. A prominent Danish philosopher of religion, K.E. Løgstrup, once characterized the essence of democracy as being a civilized way of being in disagreement, or to put it negatively, a primary purpose of democracy is to avoid violent confrontations of power when disagreements are to be resolved (Løgstrup 1985:21). What is interesting about Løgstrup's way of viewing democracy is that he takes his point of departure in a concept of society which is fundamentally characterized by disagreements and conflicts. These will unavoidably manifest themselves in the form of violent struggles unless they are mediated by democracy's civilizing institutions.

This conception is apparently quite straightforward and easy to understand. But, a number of serious issues are raised as soon as the daily activities of the schools are seen in this light. This applies not only to the educational content of the schools and the methods by which this content is taught, and the role of the teachers' and pupils' role in the teaching process, but also to the social framework within which the school functions. These problems obviously apply to all subjects, but they have immediate relevance in particular in environmental education.

The content of Danish education, as has been noted, is largely characterized by modes of thought based on the supposed existence of not controversial objective knowledge, which, by extension, generates the possibility of using that knowledge to generate "enlightened" social harmony. It is this focus which has led, in geography, to approaches which have, alternatively, focused on empirical detail and scientific/statistical models. If, however, one takes one's point of departure in the conflicts which generate the perception of environmental problems, then one enters into a realm in which all knowledge (also that of the teacher) is relative. The degree to which environmental education comes to involve such conflicts is illustrated by the following statements.

The pupils refer to a nearby factory which produces both deadly chlorine gas and feed from soya beans, the name of this latter product, directly translated from Danish, is "soya-cake". Because the soya cake production creates a strong stench down wind from the factory, it has been given the nickname "The Soya Cake". Besides periodic gas leaks, the plant also produces other pollutants, particularly mercury, which is deposited as sediment in Copenhagen harbor. There have been several leakages from the plant and one of the buildings (which did not contain the gas) was demolished by an explosion several years ago. Many local residents therefore worry about the safety of the plant. The plant is owned by one of Denmark's biggest and most influential mercantile firms, and since they claim they would rather close than move the plant (which is in a densely populated area near the city center), neither the political right or left (because of the threatened loss of jobs) seems to be willing to take effective action. The pupils, however, must try to live with the plant. The following statements are made by 8 years old pupils at a nearby school, as reported by their teachers:

"If there is a big leak from the soya cake factory one can die."

They don't always turn on the alarm when there is a leak"

"It is scary to think about a chlorine leak"

"The soya cake factory is right next to my day-care center. It smells a lot, and I am afraid."

"The soya cake stinks, people get damned sick when there is a leak. It smells like heck. It is a shame that it is where it is."

"I have an allotment garden next to the soya cake factory. It shouldn't be allowed to smell so bad. We are not allowed to eat the things we cultivate."

"The soya cake pollutes and stinks. If only they could move it."

> *"Over in the Balloon Park Development we're not allowed to eat the apples from the trees, but we do it anyway. It is like Tjernobyl."*
>
> (Christensen and Nielsen 1988)

Such statements show that pupils are aware of and experience a great deal of anxiety with regard to environmental problems. There is clearly a need to deal with such problems in the context of environmental education. Nevertheless many teachers appear to be unwilling to confront such issues. The teachers at the school thus report:

> *Quite a few teachers are of the opinion that children in the youngest grades ought only be confronted with good and positive experiences in environmental education. An important part of such teaching, they feel, should be to familiarize the pupils with nature. This also means that the pupils should not be afraid to touch nature - in the form, for example, of earthworms. At the same time they argue that one should not deal with the sort of environmental problems which are perceived by adults, and which children have no possibility of solving. This will, they believe, leave them afraid and unable to act.*
>
> *. . . . But the children's conception of a local environmental problem shows that children <u>are</u> aware that the soya cake factory pollutes and is a danger to those who live nearby. A number of the children's statements indicate that they experience anxiety in relation to the factory.*
>
> *. . . . The problem for us is thus not the introduction of a theme concerning a local problem, which might frighten the children. The children are already afraid. We have agreed not only that it requires pedagogical tact to include the issue in our teaching, but that it is necessary to do so. We must give them relevant information, but it should be noted that it must be that information which is*

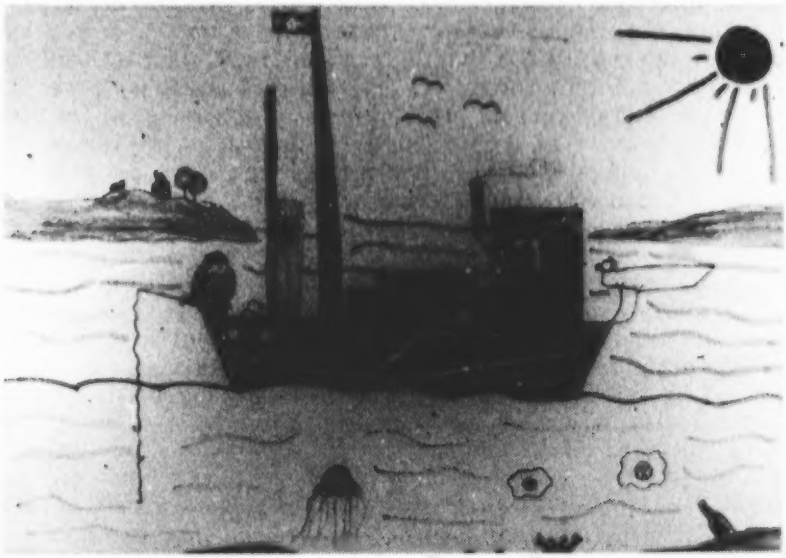
> *necessary in relation to the topic. We must not try to relieve their anxieties concerning the factory by giving them misinformation such as : "They will no doubt transfer the chlorine gas production to another location," but rather get them to express, draw, etc. their feelings and ideas about the factory.*
>
> *It simply must be important for the children to work out their anxieties/fears which they have concerning the problem.*
>
> (Christensen and Nielsen 1988)

(The whole pilot-project is described at page 28-38)

The nature of environmental problems makes it difficult, in teaching, to get around the fact that different interests - economic, social, recreative - are involved in a power struggle in which economic issues normally determine the direction of the course of development. Small children, in their own way, are willing to confront these issues head-on, but they are usually not dealt with in the school, not to mention in the homes. It is in such a context that a broadly based discipline such as geography, by applying its many facets to a given problem, can justify its existence. A subject such as industrial location is already, in fact, very much a part of the public debate. The geography teacher can use the debate not only to illuminate a sub-discipline, but also to make problematic location theory when it is presented in a technocratic context. One can, for example, raise the question of how one can deal with the contradiction between, on the one hand, the economics of plant location, and, on the other, the issue of environmental quality in an urban area where many depend on the plant for their livelihood. One can likewise examine the physical geographical components of the debate. Here we are involved in issues ranging from the prevailing wind direction, and its role if there is a leak, to issues involving the degree to which air, water and soil can be exposed to various heavy metals before they begin to have a serious effect on environmental quality. One can furthermore critically examine the objectivity and precision of

natural science knowledge when it is applied to the socio-political arena.

According to our school legislature the school day ought to be characterized by freedom of thought, comprehensiveness and training for democracy. Much suggests that these democratically agreed upon formulations conceal a reality which, in practice, conveys rather one-sided normative and idealistic conceptions of the world. In this sense, one can speak of a "parallelism problem" which is a manifestation of a parallel and uncoordinated perceptual development between, on the one hand, the private world of the child, and, on the other, the public world of the school. It results from a schism between the normative and not controversial conceptions of the world which the school seeks to convey, and the realm of the pupil's own experience, which is filled with concrete conflicts.



Shall the goal for environmental education be that the pupils preserve the childhood perception of harmony in the human/nature relationship or shall the pupils be confronted with the oftentimes disquieting realities presented by environmental problems? On the one hand, it is not desirable for children to be frightened into passivity, but on the other hand, awareness of the real threat to the environment is necessary for engagement in the democratic process.

The vision of enlightened social harmony emerging from objective disciplinary knowledge, which the school to a large degree *communicates*, is clearly a projection of the disciplinary ideals behind quite a few of the school subjects. But it is a vision which extends much further, with the consequence that the school, as an institution, has difficulty communicating a democracy's fundamental nature as a civilized means of solving conflicts.

The teacher in conflict

Our experience with our experimental instruction program in environmental education shows that the pupils' anxiety over a conflict filled world is shared by the teachers who are afraid to deal with such fundamental social (and epistemological) problems in their teaching. By focusing on conflict the teacher ceases to be a communicator of "ethically neutral" knowledge, to assume the much more complicated role of being a person who through discussions with the pupils must take a position not only with regard to what is true or false, but also with regard to what it is good or bad. This role is a new one, where the teacher's security as the transmitter of the discipline's objective "truth" is undermined by the introduction of a less clearly defined situation, where the teacher's entire persona becomes involved in a democratic discourse.

This new role for the teacher has proved to be difficult to put into practice. In many cases the teachers have stated that they were nervous about teaching subjects and problems which directly or indirectly are related to the parents' work and life. An example of this viewpoint is the following statement from the project report from a school located in a fishing community on the northern tip of Jutland.

> *For us there was no doubt that a subject such as the environmental problems related to the modern Danish fishing industry would become quite emotional because the pupil's fathers and mothers in many cases are quite involved in this occupation. We did not desire, in any case, any of the family confrontations which could be the result of such a subject.*

This conflict avoidance syndrome, though it is rarely so explicitly stated, judging from our reports, appears to be quite common. It is a paradox of democracy, that it is precisely in the small-scale neighborly societies, such as the fishing society represented above, that the limitations, on the personal level, of such a democratic approach become most pronounced. The question is whether the dangers of raising such controversial issues is not exaggerated. Raising them might "clear the air" - to use an environmental metaphor.

The desire to avoid conflict in education has the consequence that despite the fact that much lip service is paid to the importance of environmental problems and the need for environ-mental education, education for democracy and with democracy in this area may well, in the long run, prove to be a will-o-the-wisp. Though individual teachers may wish to pursue such an approach, it will meet, and has already met with opposition or indifference from political and other interests which, apparently, have no desire to be confronted with neither the environmental problems with which they are involved, nor with the civilized democratic process of solving them. Political authorities have thus tended to favor the granting of time off to teachers to participate in specialized courses, rather than courses in environmental education. In this way they are able to determine whether our disciplines will act to increase the social perception of such problems, or whether it will act as a comforting source of scientific certitude, strengthening our faith in the possibility of an ultimate enlightened harmony of man and environment. In the context of primary and secondary education, the question of discipline vs. institution is by no means academic.

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